

THE PROBLEM OF RADIO REALLOCATION



OCTOBER 1928

The Problem of Radio Reallocation

How the Present Law Operates

Effect of the Davis Amendment

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Pro and Con

Will the Davis Amendment Bring Better Radio?

Regular Departments

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The Congressional Digest

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ALICE GRAM ROBINSON, NORBORNE T. N. ROBINSON, *Editors and Publishers*
Editorial Offices, Munsey Building, Washington, D. C.

Published Every Month, except for July and August. Current Subscription Rates: \$5.00 a Year, Postpaid in U. S.; in Canada \$5.25; Foreign Rates \$5.50; Current Numbers 50c a copy; Back Numbers 75c a copy; Volumes III, IV and V, Bound, \$7.50 each; Unbound, \$6.00. Address all Orders and Correspondence to:

THE CONGRESSIONAL DIGEST, Munsey Building, Washington, D. C.

Copyright, 1928, by Alice Gram Robinson, Washington, D. C.
Entered as Second-Class Matter September 26th, 1921, at the Post Office at Washington, D. C., Under the Act of March 3, 1879.
Additional entry as Second-Class Matter at the Post Office at Baltimore, Maryland, under the Act of March 3, 1879; authorized August 22, 1927

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Eighteen Years of Radio

1910—On June 24, President Taft signed the first bill ever passed by Congress having any relation to radio communication.

This measure was directed solely to the safety of life at sea and its passage was due to the development of unrestricted use of wireless telegraphy and wireless telephony to the extent that it was interfering with the transmission of public and private messages, including calls from vessels in distress.

Discussion of this situation in various committees of Congress led to the definite consideration of legislation by the House Committee on Merchant Marine and Fisheries of a bill which was formally taken up by that committee on March 7, 1910.

First Law Aimed at Safety at Sea

The reason this bill was referred to the Committee on Merchant Marine and Fisheries was that it had to do with radio communications to and from merchant ships only.

At that time there were no land radio broadcasting sta-

tions and the legislation was aimed at marine communication without thought of what was later to come.

Consequently, when radio development subsequently grew to include land broadcasting, all bills relating to radio introduced in the House were still referred to the Committee on Merchant Marine and Fisheries.

The Act of June 24, 1910, required all vessels leaving a port of the United States which carried fifty or more persons, including the crew, to be provided with radio apparatus capable of covering a service area of one hundred miles, and compelled masters of vessels to maintain a constant watch for distress signals. These provisions of the Act are still in force.

1911—On July 1 a radio division was organized in the Department of Commerce to administer the provisions of the Radio Act of 1910.

The Steamship Titanic

1912—On April 15, the British passenger steamship *Titanic*, on her maiden voyage, struck an iceberg in the

North Atlantic waters and was sunk. Wireless telegraphy was used effectively and resulted in the rescue of more than 700 survivors.

On June 4 the International Radio Telegraph conference met in London and approved regulations for uniformity of practice in wireless telegraphy.

July 5—The International Radio Telegraphic convention was signed at London.

July 23—An Act of Congress was approved extending the provisions of the Act of June 24, 1910, to cover cargo vessels and prescribing the radio facilities they should carry.

The Radio Act of 1912

On August 13 Congress passed what became known as "the Marine Act of 1912."

It was entitled "An act to regulate radio communications" and was the first general law covering the use of the radio in the United States. Some of the provisions of the Act of 1910 were repealed by this act.

Under the provisions of the Marine Act of 1912 the radio systems of the United States grew up and many regulatory practices were established. It was devoted to the question of possible interference between state and interstate operators and required a license for interstate transmission and for radiograms and signals, which might extend beyond the jurisdiction of the territory where they were made. It contained all the regulations affecting radio communication, which were enacted until the passage of the act of February 23, 1927.

Broad Powers of Act Described

In his book, "The Law of Radio Communication," Stephen Davis, former solicitor of the Department of Commerce, said:

"Although the 1912 Act was inspired by conditions existing in the marine service, the language used was so broad that it was evidently the intent of Congress to include all forms of radio communication.

"Section 1 of that act required a Federal license before engaging in interstate or foreign communication by radio at any place within the jurisdiction of the United States except the Philippine Islands. The Secretary of Commerce was authorized to grant the license.

"It was argued that under the act no license was required for broadcasting, the contention being that it was not commercial intercourse because it was generally conducted without compensation. Furthermore, it was contended that broadcasting was unknown when the law was enacted, and its inclusions could not have been contemplated.

"That broadcasting did fall within the provisions of the act, it was contended, was definitely settled by the provision that a license must be obtained for the transmission of radiograms or signals, the effect of which extends beyond the jurisdiction of the State or territory in which the same was made."

After the passage of the Marine Act of 1912 many bills covering radio problems were introduced in both branches of Congress, but none was acted upon until 1927.

1913—On November 12 the Safety at Sea Conference met in London, and included the consideration of radio problems in its program.

Development of Wireless Telephony

1914—This year was marked by increasingly successful developments in the use of wireless telephony between ships

at sea and from ships to shore, conversations being held up to a distance of 44 miles. High powered trans-oceanic stations were erected at American and European points.

September 24, public wireless service between San Francisco and Honolulu was established.

1915—On July 24 wireless communication between the United States and Japan was effected.

On July 28 the American Telephone and Telegraph Company, working with the Western Electric Company, telephoned messages from Arlington, Va. (Washington), to Hawaii, a distance of 5,000 miles.

On October 26 wireless telephone conversations were held between the Arlington, Va. station and the Eiffel Tower Station, Paris, France.

1916—During a blizzard of wide range in February the wireless was extensively used for train dispatching when the telegraph wires broke down.

Wireless "Comes of Age" in England

1917—On June 2 wireless telegraphy "came of age" in England, the first British patent having been granted on June 2, 1896.

1918—On July 31 the United States Government took over the control of all wireless land stations in the United States, but left a few high-powered stations under the control of commercial companies.

On September 22 messages were transmitted from Carnarvon, Wales, to Sydney, Australia, a distance of 12,000 miles.

1919—The successful trans-Atlantic aeroplane flights of Allcock and Brown from Canada to Ireland and the flights of the British dirigible R-34 during the summer of this year focused attention upon the successful use of radio in aviation.

On October 1 the war-time ban on amateur and private radio stations was removed.

1920—On February 13 an executive order was issued returning to the control of their owners commercial radio stations taken over by the Government during the World War. This order was effective February 29.

The Birth of Broadcasting

A number of experiments by Dr. Frank Conrad, of the Westinghouse Electrical and Manufacturing Company, resulted in experimental broadcasting by that company under a temporary experimental license for a station known as 8XX, the license for which was granted on October 22, 1920.

On November 2 the Westinghouse Company inaugurated its first general broadcasting from Station KDKA at East Pittsburgh when it broadcast the returns of the Harding-Cox Presidential election.

On the following night, November 3, KDKA began its regular evening program from 8.30 to 9.30 o'clock, which program has been maintained ever since without interruption.

First Broadcasting Licenses Issued

1921—In February attempts were begun by American amateurs to communicate with amateurs in Great Britain by wireless on short-wave lengths, but were unsuccessful.

August 30 to September 3 the American Radio Relay League held its first annual convention in Chicago. Thousands of amateurs attended.

On September 15 the Westinghouse Company was granted a broadcasting license for Station WBZ at Spring-

field, Mass., and on September 30 a license for another station at Newark, N. J., Station WJZ.

On November 7 Station KDKA of the Westinghouse Company at East Pittsburgh was granted a regular broadcasting license.

These were the first broadcasting licenses granted by the United States Government.

In December second tests by American amateurs to communicate with amateurs in Great Britain by wireless on short-wave lengths met with success. Signals from many of the American amateurs were received in England and also in Holland.

1922—On February 27, the First National Radio Conference under the auspices of the Department of Commerce met in Washington in response to a call from Secretary Hoover.

A Far Reaching Federal Court Decision

1923—On February 23 the Court of Appeals of the District of Columbia, in a mandamus suit brought by the Inter-city Radio Company, of New York City, against the Secretary of Commerce to compel him to assign wave lengths to that company, decided that:

"While the Secretary of Commerce has no right to refuse to license an applicant, he is given discretionary authority in the assignment of wave lengths for the use of the stations. While the Secretary was compelled to assign some channel the selection was left to him."

1923—On March 20 the Second National Radio Conference met at Washington.

In this year broadcasting programs in the United States were heard in England and broadcasting programs in England were heard in the United States for the first time.

On December 31 Station KDKA, East Pittsburgh, Pa., transmitted a program to Great Britain on a short wave.

1924—In February KDKA resumed broadcasting programs to England, and on the 5th of that month one of its programs was relayed from London and heard clearly in Calcutta, India.

Between August 5 and September 24 KDKA maintained clear communication with the steamship *Arctic* while on its expedition to arctic regions. Messages were received at Cape Sabine, within 11 degrees of the North Pole.

On October 6 the Third National Radio Conference met at Washington.

United States Fleet Gets Home Program in Australia

1925—During July American programs were broadcast to the American naval fleet in Australia.

The use of the telephone and radio for the transmission of photographs reached the practical stage.

Experiments in broadcasting programs from airplanes were successful.

On November 9 the Fourth National Radio Conference was held in Washington.

1926—The decision of the Court of Appeals of the District of Columbia of February 23, 1923, remained unchallenged until the Zenith Radio Corporation of Chicago refused to operate on a wave length assigned by the Secretary of Commerce. Proceedings to invoke penalties provided in the Act of 1912 were instituted by the Department of Commerce and the court held that Sections 1 and 2 of the 1912 Act defining the powers of the Secretary of Commerce were "general, vague and ambiguous."

An Opinion By the Attorney General.

Because of conflicting opinions of the courts, in which various suits had been brought, regarding the power conferred upon the Secretary of Commerce by the Act of 1912, the Secretary of Commerce requested from the Attorney General advice as to the duties and power of the Secretary of Commerce under the act.

On July 8 the acting Attorney General, Mr. Donovan, rendered an opinion in which he referred to the court decisions and held that while the Secretary of Commerce, under the Act of 1912, had authority to issue licenses for broadcasting he had no authority to assign wave lengths and power nor to fix the time in which broadcasting stations could operate.

"Chaotic" Conditions in 1926

Acting upon this opinion the Secretary of Commerce continued to issue licenses, but ceased to assign wave lengths. Stations were free to use whatever other channels they chose. Conflict, confusion and chaos resulted.

When government control of radio stations broke down there were 528 stations broadcasting with little interference. New stations sprang up like mushrooms, so that by July 1, 1927, the number had increased to 671. Many stations jumped their waves and increased their power regardless of the rights of other broadcasters. Even the channels set aside under a "Gentleman's Agreement" for the exclusive use of Canadian broadcasters, were appropriated by American broadcasters.

President Coolidge Recommends Radio Legislation

In his message to Congress December 7, 1926, President Coolidge recommended radio legislation, saying:

"Due to the decisions of the courts, the authority of the department under the law of 1912 has broken down; many more stations have been operating than can be accommodated within the limited number of wave lengths available; further stations are in course of construction; many stations have departed from the scheme of allocation set down by the department, and the whole service of this most important public function has drifted into such chaos as seems likely, if not remedied, to destroy its great value. I most urgently recommend that this legislation should be speedily enacted."

Disturbances in the air by the broadcasters became so pronounced that the public became indignant and members of Congress were bombarded by protests requesting legislation to bring about relief.

The White-Dill Radio Bill

Representative Wallace H. White, Jr., of Maine, sponsored a radio bill in the House in the Sixty-ninth Congress designed to bring order out of chaos in the air. That measure, which was passed by the House after much debate, gave the Secretary of Commerce authority to grant licenses, assign wave lengths and allot time to broadcasters.

While that bill was before the House, Senator C. C. Dill, of Washington, was sponsoring a bill in the Senate providing for an independent commission of five members, to be appointed by the President, to have practically complete charge over broadcasting. Only minor authority was delegated to the Secretary of Commerce. The Senate passed the Dill bill in the first session of the Sixty-ninth Congress, but all efforts of the conferees to reconcile the differences between the House and Senate bills failed before adjournment of the first session.

While the conferees were authorized to adjust their differences during the adjournment all efforts in that direction failed and numerous meetings were held during the short session of the Sixty-ninth Congress before an agreement could be reached.

The Radio Act of 1927

1927—On February 23 the Radio Act of 1927, passed by Congress, was approved by the President. (See special article this issue.)

On March 1 the President appointed five members of Federal Radio Commission.

On March 15 the first meeting of the Commission at Washington was called by Admiral Bullard, via Navy radio from Pekin, China.

March 29-April 1, the Commission held hearings on methods of eliminating broadcasting interference.

On April 23 the Commission issued temporary permits and temporary assignments.

On May 27 hearings were begun on broadcasters' applications for changes in frequency and power.

On June 15 assignments under re-allocation became effective and local reception was cleared.

On July 1 the commissioners started on an inspection tour.

On September 8 public hearings were held by Mr. Bellows at Indianapolis.

On October 1 public hearings were held by Mr. Bellows at Denver.

On October 9 Colonel John F. Dillon, commissioner for Pacific Coast, died.

On October 15 clearing of channels for remote listeners was begun.

On November 1 Commissioner Henry A. Bellows resigned and was succeeded by Sam Pickard, former secretary of Commission.

On November 14 600-1000 kilocycles set aside as non-heterodyning band.

On November 14 H. A. Lafount was appointed to succeed Colonel Dillon.

On November 24 Chairman W. H. G. Bullard died.

On December 1 twenty-five channels were cleared for remote listeners.

December 1-10 — Commissioners went on tour of inspection of their zones.

1928 (December to March)—Commission without a quorum confirmed by the Senate.

On March 30 the commissioners were confirmed by the Senate.

What the Radio Act of 1927 Provides

A Summary of the Law Which Controls All Radio Activities in the United States



THE principal provisions of the Radio Act of 1927 (Public Act No. 632, 69th Congress, approved February 23, 1927, entitled "an act for the regulation of radio communications and for other purposes") are as follows:

Section 1 states that the Act "is intended to regulate all forms of interstate and foreign radio transmissions and communications within the United States, its Territories and possessions; to maintain the control of the United States over all the channels of interstate and foreign radio transmission; and to provide for the use of such channels but not the ownership thereof, by individuals, firms, or corporations, for limited periods of time, under licenses granted by Federal authority, and no such license shall be construed to create any right, beyond the terms, conditions, and periods of the license. That no person, firm, company, or corporation shall use or operate any apparatus for the transmission of energy or communications or signals by radio (a) from one place in any Territory or possession of the United States or in the District of Columbia to another place in the same Territory, possession, or District; or (b) from any State, Territory, or possession of the United States, or from the District of Columbia to any other State Territory, or possession of the United States; or (c) from any place in any State, Territory, or possession of the United States, or in the District of Columbia, to any place in any foreign country or to any vessel; or (d) within any State when the effects of such use extend beyond the borders of said State, or when interference is caused by such use or operation with the transmission of such energy, communications, or signals from within said State to any place beyond its borders, or with the transmission or reception of such energy, communications,

or signals from and or to places beyond the borders of said State; or (e) upon any vessel of the United States; or (f) upon any aircraft or other mobile stations within the United States, except under and in accordance with this Act and with a license in that behalf granted under the provisions of this Act."

Section 2 divides the United States into five zones.

The Federal Radio Commission

Section 3 creates a Federal Radio Commission of five members to be appointed by the President, by and with the advice and consent of the Senate, with overlapping terms of six years each at salaries of \$10,000 for the first year and \$30 per day while on duty during subsequent years; the first chairman to be named by the President and subsequent chairmen to be elected by the members of the Commission. Not more than three of the commissioners shall be members of the same political party. Each member of the Commission must be a citizen of the United States and an actual resident citizen of a State within the zone from which he is appointed at the time of his appointment. Not more than one commissioner shall be appointed from any zone nor shall any commissioner be financially interested in the manufacture or sale of radio apparatus or in the transmission or operation of radiotelegraphy, radiotelephony or radio broadcasting.

Authority to Classify Radio Stations

Section 4 makes it mandatory upon the commission "from time to time, as public interest or necessity requires," to classify radio stations, prescribe the nature of the service to be rendered by them; to assign frequencies or wave lengths; to determine the power of the stations and the time during which they may operate; to determine the location of all sta-

tions and regulate, in all respects, the apparatus they use; make regulations to prevent interference between stations (unless in the judgment of the commission public interest, convenience or necessity will be served thereby, changes in wave lengths, character of emitted signals, authorized power or times of operation, shall not be made without the consent of the station licensee).

The Establishment of Zones

Section 4 also authorizes the commission to establish zones or areas to be served by any station; to regulate chain broadcasting programs, communications or signals; to control the conduct of radio on railroad trains; and to hold hearings, summon witnesses, administer oaths and make such investigations as may be necessary in the performance of its duties.

Life of Radio Commission Limited

Section 5 provides that after one year after the first meeting of the commission all powers conferred upon the commission, except as to revocation of licenses, shall be exercised by the Secretary of Commerce who is also directed to refer to the commission all applications for new licenses or renewal of licenses (the commission being required to consider all protests and complaints in connection with the issue of licenses); to prescribe qualifications and regulations for station operators and issue their licenses and to suspend the licenses of operators for two years if they violate the provisions of the law; to inspect all transmitting apparatus to see that it complies with the law and the regulations established thereunder; to designate call letters of all stations, to publish these together with such other data as in his judgment may be required for the efficient operation of stations. (See 1928 Amendment below.)

An Advisory Body

This section, which, in effect, makes the Radio Commission merely an advisory body after its first year, provides further that any firm, company, or corporation, or any State or division thereof whose interests are adversely affected by any ruling of the Secretary of Commerce may appeal to the commission whose decision is final (except that it is subject to appeal to the U. S. Court of Appeals of the District of Columbia, as provided in Section 16); and that no station license shall be granted until the applicant therefor shall have signed a waiver of any claim to the use of any particular wave length or of the ether as against the regulatory power of the United States because of the previous use of same, whether by the licensee or otherwise.

Government-owned Radio Stations

Sections 6, 7 and 8 apply to radio stations belonging to and operated by the United States Government, their important provisions being as follows:

All government stations are under control of the President of the United States. Except the stations on board naval or other government vessels while at sea, and except when transmitting government messages, all government stations must conform to such general rules and regulations designed to prevent interference with other radio stations and the rights of others as the Radio Commission and the Department of Commerce may prescribe.

Powers of the President

In event of war or other national emergency the President is authorized to suspend all rules and regulations covering the use of radio within the jurisdiction of the United States and take complete control over it.

Provision is made for the payment to private owners for

the use of radio stations and equipment by the Government under these conditions, by having the amount the owner is entitled to certified to Congress. If the amount certified by the President is unsatisfactory to the owner, the owner shall be paid 75 per cent of his claim and shall be entitled to sue the government for the remainder.

All government stations, except the mobile stations of the U. S. Army, shall have special call letters designated by the Secretary of Commerce.

Rules for Foreign Ships

The Act does not apply to owners of stations sending signals on foreign ships while they are within the jurisdiction of the United States, but their communications and signals at such time must be transmitted in accordance with the general American radio regulations.

Section 9 provides that "the licensing authority, if public convenience, interest or necessity will be served thereby, subject to the limitations of this Act, shall grant to any applicant therefor a station license provided for by this Act." It further provides that in considering applications the commission shall make such a distribution of frequency of wave lengths, operating periods and power among the different States and communities as "to give fair, efficient and equitable radio service to each of the same."

Section 9 also provides that no license for broadcasting shall be for a period of more than three years and no license for any other class of station for a period of more than five years. Renewals are limited to the same periods as original license. No renewal of any station license may be granted more than thirty days prior to the expiration of the original license. (See 1928 Amendment below.)

Issue of Licenses

Section 10 contains the following provisions for application and issue of licenses:

All applications for licenses must be made in writing and filed with the Secretary of Commerce. They must set forth the citizenship, character and financial, technical and other qualifications of the applicant to operate a station; the ownership and location of the proposed station and the stations with which it intends to communicate; the frequencies and power of wave lengths proposed to be used; the time at which it is proposed to operate; the purpose for which the station is to be used and such other information it may require. Additional statements on these points may be called for by the commission at any time after the filing of the original application. All statements must be signed by the applicant under oath or affirmation.

Licenses granted for a station to be used for communication with territories of the United States or with foreign countries are subject to the conditions of the submarine cables Act of May 24, 1921.

Right to Be Heard Granted

Section 11 provides for the granting of hearings to applicants for licenses whose applications have been denied by the commission and provides the following specific conditions to which, in addition to general regulations, each license shall be subject:

"(A) The station license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies or wave length designated in the license beyond the term thereof nor in any other manner than authorized therein.

"(B) Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of this Act.

"(C) Every license issued under this Act shall be subject in terms to the right of use or control conferred by Section 6 hereof."

This section gives the Secretary of Commerce the powers of the commission in cases of emergency or when the commission is not in session.

Those Who May Not Be Licensed

Section 12 specifies, as follows, those to whom the commission is expressly forbidden to issue or transfer licenses:

(a) Any alien or the representative of an alien; (b) any foreign government or representative thereof; (c) any company, corporation or association organized under the laws of any foreign government; (d) any company, corporation or association more than one-fifth of whose stock is foreign-owned or foreign controlled.

It further provides that no station license or rights obtained thereunder shall be transferred or disposed of in any manner without the written consent of the commission.

Section 13 directs the commission to refuse a station license to or revoke the license of any person or organization found guilty of unlawfully monopolizing or attempting to monopolize radio communication, directly or indirectly through the control of radio apparatus or by any other means of unfair competition and provides for court procedure for the dissolution of any such firm or organization.

Revocation of Licenses

Section 14 provides for the revocation of station licenses by the commission for false statements, failure to provide reasonable facilities for transmission of radio communication of these laws by radio concerns may decree, in addition may take effect until thirty days' notice in writing has been given to the licensee, who is also given a right to be heard.

Section 15 provides that all Federal laws applicable to monopolies shall be applicable to manufacturers of radio apparatus and devices and that the court, in cases of violation of these laws by radio concerns may decree, in addition to the regularly prescribed penalties, the revocation of licenses.

Section 16 gives the right to applicants and holders of station or construction permits or licenses, the right to appeal from decisions of the commission regarding licenses to the Court of Appeals of the District of Columbia.

Section 17 forbids radio companies from acquiring ownership in telegraph or cable companies and vice versa.

Candidates for Public Office

Section 18 provides that "if any licensee shall permit any person who is a legally qualified candidate for any public office to use a broadcasting station he shall afford equal opportunities to all such candidates for that office in the

use of such broadcasting station and the licensing authority shall make rules and regulations to carry this provision into effect: *Provided*, that such licensee shall have no power of censorship over the material broadcast under the provisions of this paragraph. No obligation is hereby imposed upon any licensee to allow the use of its station by any such candidate."

Section 19 provides that all matter broadcast for which service money is directly or indirectly paid, shall, at the time it is so broadcast be announced as paid for.

Section 20 provides that all transmitting apparatus of a station shall be carried on by a person holding an operator's license.

Construction Licenses Necessary

Section 21 provides that no station license shall be granted to use a station unless that station has been constructed under a construction license and sets forth the conditions under which such construction is to be done.

Section 22 authorizes the commission to designate stations whose services are liable to interfere with distress signals from ships and to control them.

Section 23 covers the equipment of ships with radio facilities and their regulation.

Section 24 makes it mandatory upon shore stations open to public service between the coast and vessels at sea to exchange signals with any ship regardless of the type of equipment used and places the same mandate upon vessels at sea with respect to coast stations.

Section 25 and 26 contain regulations for co-operation between government and private stations in proximity to each other.

Section 27 applies to radio communications the same regulations for the privacy of messages as apply to telegraph and telephone messages.

Section 28 forbids the broadcasting of false or fraudulent signals of distress or the rebroadcasting of programs without the express authority of the originating station.

Power of Censorship Denied

Section 29 provides that "Nothing in this act shall be understood or construed to give the licensing authority the power of censorship over the radio communications or signals transmitted by any radio station, and no regulation or condition shall be promulgated or fixed by the licensing authority which shall interfere with the right of free speech by means of radio communications. No person within the jurisdiction of the United States shall utter any obscene, indecent, or profane language by means of radio communication."

Section 30 authorizes the use of Navy radio stations for the transmission of private messages and messages for the press, when not in competition with privately owned stations.

"Radio Communications" Defined

Section 31 gives the definition of the expression "radio communications" as being "any intelligence, message, signal, power, pictures, or communication of any nature transferred by electrical energy from one point to another without the aid of any wire connecting the points from and at which the electrical energy is sent or received and any system by means of which such transfer of energy is effected."

Section 32 provides for a fine of \$500 for violation of the Government rules and regulations set up under the Act.

Section 33 provides for a fine of \$5,000 or imprisonment of not more than five years, or both, for violation of the Radio Act by making false statement in any affidavit required by the Act.

Section 34 states that offenders against the act who are brought to trial shall be tried in the judicial district where the offense is committed. If the offense is committed upon the high seas or out of the jurisdiction of any particular state or district, the trial shall be in the district where the offender may be found or into which he may be first brought.

Section 35 exempts from the provisions of the Act the Philippine Islands and the Canal Zone, which, it declares, shall be represented in international matters by the Secretary of State.

Sections 36 and 37 have to do with administrative features in connection with Government radio stations.

Sections 38, 39, 40 and 41 cover the application of the Act, its repeal of the Radio Act of 1912 and other Act, etc.

The Davis Amendment to the Radio Act

Editor's Note: On March 28, 1928, the Davis Amendment was approved by the President. It is under the mandate of this Amendment that the new reallocation of wave lengths was ordered by the Federal Radio Commission



E IT enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That all the powers and authority vested in the Federal Radio Commission by the Radio Act of 1927, approved February 23, 1927, shall continue to be vested in and exercised by the commission until March 16, 1929; and wherever any reference is made in such Act to the period of one year after the first meeting of the commission, such reference shall be held to mean the period of two years after the first meeting of the commission.

Section 2. The period during which the members of the commission shall receive compensation at the rate of \$10,000 per annum is hereby extended until March 16, 1929.

Section 3. Prior to January 1, 1930, the licensing authority shall grant no license or renewal of license under the Radio Act of 1927 for a broadcasting station for a period to exceed three months and no license or renewal of license for any other class of station for a period to exceed one year.

Section 4. The term of office of each member of the commission shall expire on February 23, 1929, and thereafter commissioners shall be appointed for terms of two, three, four, five and six years, respectively, as provided in the Radio Act of 1927.

Section 5. The second paragraph of Section 9 of the Radio Act of 1927 is amended to read as follows:

"It is hereby declared that the people of all the zones established by Section 2 of this Act are entitled to equality

of radio broadcasting service, both of transmission and of reception, and in order to provide said equality the licensing authority shall as nearly as possible make and maintain an equal allocation of broadcasting licenses, of bands of frequency or wave lengths, of periods of time for operation, and of station power, to each of said zones when and in so far as there are applications therefor; and shall make a fair and equitable allocation of licenses, wave lengths, time for operation, and station power to each of the States, the District of Columbia, the Territories and possessions of the United States within each zone, according to population. The licensing authority shall carry into effect the equality of broadcasting service hereinbefore directed; whenever necessary or proper, by granting or refusing licenses or renewals of licenses, by changing periods of time for operation, and by increasing or decreasing station power, when applications are made for licenses or renewals of licenses: *Provided*, That if and when there is a lack of applications from any zone for the proportionate share of licenses, wave lengths, time of operation, or station power to which such zone is entitled, the licensing authority may issue licenses for the balance of the proportion not applied for from any zone, to applicants from other zones for a temporary period of ninety days each, and shall specifically designate that said apportionment is only for said temporary period. Allocations shall be charged to the State, District, Territory, or possession wherein the studio of the station is located and not where the transmitter is located."

Radio Zones Established by Act of 1927

First Zone—Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Delaware, Maryland, the District of Columbia, Porto Rico, and the Virgin Islands.

Second Zone—Pennsylvania, Virginia, West Virginia, Ohio, Michigan, and Kentucky.

Third Zone—North Carolina, South Carolina, Georgia,

Florida, Alabama, Tennessee, Mississippi, Arkansas, Louisiana, Texas, and Oklahoma.

Fourth Zone—Indiana, Illinois, Wisconsin, Minnesota, North Dakota, South Dakota, Iowa, Nebraska, Kansas, and Missouri.

Fifth Zone—Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, the Territory of Hawaii, and Alaska.

Problems Raised by the Davis Amendment

Mandates of the Amendment — Increase of Power — Rigid Principles Imposed — Situation in Fourth Zone—

The "Fair and Equitable" Provision — The Reallocation Plan

By Louis G. Caldwell,

Chief Counsel Federal Radio Commission

It would be hard to conceive of a more baffling problem than the one which Congress imposed upon the Federal Radio Commission by the so-called Davis Amendment. This amendment became law on March 28, 1928, and changed the provisions of Section 9 of the Radio Act of 1927 insofar as they had to do with the distribution of broadcasting stations throughout the United States.

Before the amendment became law the commission's difficulties were great enough; somehow it had to accommodate (or dispose of) 700 broadcasting stations on 90 channels, 11 of which were shared with Canada and could not be used by stations of substantial power. The task had to be accomplished in such manner as to get the maximum of good radio reception for the listening public, although every informed person knew that there were too many stations, particularly stations having power of 500 watts or more, to be satisfactorily accommodated. The stations had not sprung into being according to any orderly, scientific plan, either with regard to location or power. The law, as it existed prior to the amendment, allowed the commission a certain amount of latitude in making its distribution among the different States and communities, the requirement being that the commission "give fair, efficient and equitable radio service to each of the same." The commission was thus permitted to avoid hardship and injustice to particular regions, cities and stations.

Mandates of the Amendment

The difficulty of the task was multiplied many times by the rigid directions contained in the Davis Amendment. This amendment had as its declared purpose:

"That the people of all the zones * * * are entitled to equality of radio broadcasting service, both of transmission and reception."

Against this declaration no serious complaint has been, or can be, registered. The difficulty has proceeded from the methods which Congress prescribed for providing the desired equality. These methods are as follows:

1. "The licensing authority shall as nearly as possible make and maintain an equal allocation of broadcasting licenses, of bands of frequency or wave lengths, of periods of time for operation, and of station power, to each of said zones when and insofar as there are applications therefor; and

2. "Shall make a fair and equitable allocation of licenses, wave lengths, time for operation and station power to each of the States, the District of Columbia, the Territories and possessions of the United States within each zone, according to population."

Curiously, the declared purpose of the Amendment and the methods prescribed for attaining the purpose stand in irreconcilable contradiction. Radio broadcasting service depends upon geographical considerations, principally dis-

tance and area, and not upon population. Approximately correct figures with regard to population and area of each zone and of the radius of the largest circle that can be drawn in each zone are as follows:

	Population	Area	Radius of Circle
First Zone.....	27,385,288	129,110	250 miles
Second Zone.....	28,123,000	247,517	131 miles
Third Zone.....	28,088,618	761,895	427 miles
Fourth Zone.....	26,786,192	658,148	380 miles
Fifth Zone.....	11,266,244	1,774,437	725 miles

Hardships Inflicted

A broadcasting station furnishes service to an approximately circular area around it, the service being better as one approaches the station and increasingly less satisfactory as one is removed from the station. Leaving aside peculiar natural phenomena which may effect the range of service of a particular station, a station of a given power will cover an approximately equal circular geographical area wherever it may be located. It is obvious, therefore, that the First Zone with its small area will be better served by a given number of broadcasting stations of given power than the very large Third, Fourth and Fifth Zones. Nevertheless, Congress has prescribed that the number of stations and amount of power in each of these zones shall be equal. There is reason for believing that Congress intended by the amendment to strike at what was considered to be an excessive allocation of broadcasting facilities to the First Zone, which includes New York City and a large portion of the super-power stations. The unexpected result of the amendment has been to favor the First Zone and to cause hardship, both present and future, in the Third, Fourth and Fifth Zones.

Increase of Power

Radio engineers seem to be agreed that once a station of 5,000 watts (or even considerably less) is licensed to operate on a particular channel no other station can be licensed to use the same channel simultaneously anywhere in the United States, because of the heterodyne interference which would result. They also seem to be agreed that since this is so, it is in the interest of good radio reception to permit such a station, operating on one channel exclusively, to increase its power to a much larger amount so that it will serve a larger area effectively. The only restriction on this is that the geographical location of such a station must be wisely chosen so as to be removed a certain distance from the thickly inhabited portions of metropolitan areas, so as to avoid blanketing reception from other stations in adjacent channels. The range of such stations is such that they may easily serve more than one zone in cases where the zones are small in area or the stations are located near the boundary lines. The First and Second Zones, therefore, are likely to be served by the high-powered stations of both zones with an increase in broadcasting service where remote portions of the Third, Fourth and Fifth Zones will

not have this advantage. This type of station seems to be absolutely necessary in order to serve the rural population of the country and persons dwelling at distances from the large cities.

Rigid Principles Imposed

There are many other considerations that serve to complicate the satisfactory operation of any such rigid principles as are imposed by the Davis Amendment. Stations located on either the Atlantic or Pacific coasts transmit a large portion of their energy over the high seas, while a station of equal power located in the interior of the country will serve approximately twice the area. There is a difference of three hours in time between the Atlantic and Pacific coasts which can be used economically in a limited number of cases by requiring the Eastern station to close down in time to leave a substantial portion of the evening still open to Western stations. This advantage of difference in time is not as available to the same degree as between stations located in portions governed by any other than Eastern Standard Time. Stations operating during the daytime have a far more restricted range, both of service and of interference, than the same stations operating at night time. Differences of time are of manifest importance in taking advantage of this fact so as to permit the operation of a certain number of daytime stations. The 11 channels which have been assigned to shared use by Canadian and American stations can accommodate stations of only extremely small power near the northern boundary of the United States, while stations of as much as 500 watts can operate in the southern part of the country in the Third Zone. There are in the country many stations operated by religious and educational institutions or other organizations requiring only limited time for operation. Naturally, these are not divided equally between zones and yet can be accommodated by economical use of daytime operation, divisions of time and the like.

Fourth Zone the Chief Sufferer

The chief suffered from the immediate application of the Davis Amendment has been the Fourth Zone. At the time the Davis Amendment was enacted it had approximately 200 stations, whereas none of the other zones had in excess of 130. Furthermore, a large number of those stations were of substantial power, of 5,000 watts or more. By virtue of the hearings conducted by the commission during the summer of 1928, as well as certain consolidations between stations, the number has now been reduced to 155, but the Fourth Zone still has a large excess of stations over the next highest zone. The First Zone has also been a heavy sufferer from another point of view. Because of the fact that its distance made it possible for stations of 1,000 watts or less to operate simultaneously on the Pacific Coast with stations on the east, it was using about 74 different channels. This number has had to be reduced to approximately 33.

The Third, Fourth and Fifth Zones will suffer with respect to the number of small stations that can be accommodated if the Davis Amendment continues to be law. A large number of stations of 100 watts or less can be accommodated in the larger zones, provided that a proper geographical separation between them is maintained. The same number cannot possibly be accommodated in the First and Second Zones. The larger zones will, therefore, be held down by the physical limitations of the smaller zones.

The Reallocation Plan

The commission, after months of study and consultation with radio engineers and broadcasters, has announced a plan and an allocation which, in its opinion, comes as close as is possible to complying with the Davis Amendment. The plan was incorporated in General Order 40, issued and promulgated on August 30, 1928, and by the complementary General Order 42. Under these orders each zone has been assigned eight specific frequencies for use by stations with authorized power up to 25 kilowatts and for experimental purposes up to 50 kilowatts. Thirty-five frequencies were assigned for use by not less than two nor more than three zones simultaneously, with stations having authorized power not to exceed 1,000 watts to be allocated equally to the zones. Six frequencies were allocated for use in all five zones by broadcasting stations with authorized power not to exceed 100 watts. Four frequencies were allocated for use by not less than two zones with broadcasting stations having authorized power not to exceed five kilowatts. Five frequencies were allocated for use in all five zones with broadcasting stations having authorized power not to exceed 1,000 watts. The allocation of a frequency carried with it an assignment of full-time operation on that frequency. In my opinion, the plan incorporated in these orders fully complies with the requirements of the Davis Amendment insofar as it requires equality in frequencies, periods of time for operation and station power, certainly, when the qualification contained in the words "as nearly as possible" is considered. The plan does not purport to attain equality in number of broadcasting licenses as between the zones, and, of course, this does effect equality on total station power and total periods of time for operation. Taking the total number of stations now in existence, we find that the average number per zone is 123. The Fourth Zone has 155 stations, or an excess of 32, and the Fifth Zone has a slight excess. The Davis Amendment does make provision for "borrowing" as between the zones, but satisfactory use cannot be made of this clause. The allocation has to be based on very careful consideration of geographical separation between the stations and proper separation between channels in stations in the same locality. Use of the borrowing clause would only throw any such carefully arranged system out of order. The inequality in number of stations can be partly cured by further licensing of small stations, but this has to be done very carefully in the First and Second Zones, so as not to cause undue interference. On the whole, I believe the commission has come as near as it is possible to complying with the Davis Amendment, and there is reason for serious doubt as to whether the requirement of equality of broadcasting licenses as between the zones should be preserved.

The "Fair and Equitable" Provision

I shall not attempt any analysis of the new allocation with respect to whether it achieves the "fair and equitable allocation . . . according to population," as between the States in each zone. That such an allocation has not been achieved with mathematical precision is apparent and was to have been expected. It is my opinion that Congress did not intend to make any such rigid requirement and that by use of the word "equitable" it intended to allow the commission a considerable latitude, permitting it to take other factors, such as the existing situation, into consideration.

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The Department of Commerce Radio Service

By W. D. Terrell,

Chief of Radio Division, Department of Commerce



HE Radio Service of the Department of Commerce was organized on July 1, 1911, to enforce the radio law applying to ships. This law provides that it is unlawful for any steamship, foreign or American, carrying fifty or more persons and running two hundred miles or more between ports, to leave, or attempt to leave, a port of the United States without having a radio installation in good working order capable of working one hundred miles day or night and an emergency source of power which may be substituted for the ship's source of power if necessary.

The law also provides that the installation shall be in charge of two or more radio operators in order that a continuous watch may be maintained while the vessel is being navigated. This service is maintained to give protection to lives and property and it has been instrumental in saving many lives and many vessels.

One outstanding case is that of the S. S. Titanic which met with disaster on April 15, 1912. Seven hundred and three lives were saved through assistance secured by wireless. A large number of persons lost their lives before the rescue ship could reach the vessel, but undoubtedly these 703 persons would have gone to the bottom of the ocean had it not been for the use of wireless.

Inspection of Ships' Radios

The radio inspectors of the Department of Commerce, Radio Division, are directed to give first consideration to the important duty of inspecting the radio installations on ships before the vessels sail. For this purpose inspectors are located at the principal seaports—Boston, New York, Philadelphia, Baltimore, Norfolk, New Orleans, San Francisco, Seattle, Detroit and Chicago.

During the fiscal year 1927, 9330 inspections were made of vessels coming under the law and 1405 inspections were made of vessels voluntarily equipped with radio, making a total of 10,735 inspections of ship installations during that fiscal year.

Licensing Radio Operators

In addition to the inspection of radio equipment to insure its efficiency the radio operators assigned to commercial vessels are given a strict examination to determine their fitness for this important work. If they pass the examination they are issued appropriate licenses.

There is a monument erected at the Battery in New York to the memory of radio operators who have gone down with their ships. Each year new names are carved on this monument.

International Radio Regulation

In 1912 the Act to Regulate Radio Communication was passed by Congress and became law, also the International Radiotelegraph Convention was amended at London. Briefly, the purpose of this law and international treaty was to insure uniformity of practice and prevent interference. Under this law all radio stations were licensed, wave lengths assigned,

call letters assigned, power and hours of operation specified. Both the radio law and International treaty provided that the wave length of 600 meters, 500 kilocycles, was to be used by all vessels for signals of distress. At that time radio was used almost exclusively for ship-to-ship and ship-to-shore communication. Transoceanic service was considered in the experimental stage. Radio broadcasting was unthought of. Point-to-point communication over land was also in the experimental stage. A number of amateur stations were operating with little or no regulation.

Rapid Growth of the Radio

In 1912 this country had 483 merchant ships equipped with radio. In 1927 there were 2092. We had one transoceanic station operating more or less irregularly. In 1927 we had 26 such stations communicating with the principal countries of the world. As I said before, we had no broadcasting stations, while in 1927 we had 694. We had 1224 amateur stations, while in 1927 we had 15,926.

Until broadcasting started in 1921 there was no great pressure for the use of wave lengths. The ships were able to handle their traffic on a few channels. The transoceanic service was carried on on the very long wave lengths and the amateurs were permitted to use 200 meters and below. Since 1912 the development of broadcasting necessitated the assignment to this service of the wave lengths from 200 meters to 545 meters. The amateurs were given several bands of wave lengths below 200 meters and the commercial interests found that the wave lengths below 200 meters were particularly well adapted for long-range communication with reduced power. Now there is a great demand for wave lengths and opportunity to communicate internationally and nationally by both radiotelephone and radiotelegraph.

Strict Supervision of Stations

This constantly growing interest in radio communication extends throughout the world and it is necessary to strictly supervise the operation of all stations to prevent interference nationally and internationally between the commercial services, private services and government services. It is not unusual for the radio inspectors of the Department of Commerce who have put in their full day's work at the office or in inspection work to remain on duty until midnight or later checking the wave lengths, or frequency of operating stations to determine if there is any interference, which stations are violating the law or the provisions of their license.

Policing the Ether Highways

In the early days it was necessary to inspect ship stations and stations working with ships only. Now it is necessary to inspect all stations and to carefully observe their operation. These ever-increasing duties have taxed the inventor and the manufacturer to provide accurate measuring instruments for the use of our service. Few people realize the difficulty of policing the ether highways and endeavoring to prevent conflict between these invisible carriers of messages relating to distress, commerce, entertainment, education, farm

reports, stock reports, weather forecasts, time signals, government communications, pictures, fac-simile messages and the many other messages of various character which are passing through the ether hourly not only originating in this country but many of them originating in other countries and often passing through this country.

It is not unusual for the amateur with his homemade set using power of perhaps 100 watts or less to transmit a message which is picked up in Europe, Australia or New Zealand. The slightest disarrangement in transmitting apparatus may cause this message to interfere with some other service.

Portable Radio Inspection Offices

The inspection service is now equipped with four radio test cars and we will have two more before the end of this calendar year. These cars are portable radio inspection offices

equipped with apparatus which enables the inspector to measure the strength of signals from a radio station and determine the power the station is using, to check the wave length or frequency of stations, to monitor the programs and facilities for giving examinations to radio operators. These cars are proving a great convenience in enabling the inspector to travel around the country without having to rely on infrequent train service in any place and accomplishing much more work and doing it much more efficiently than can be accomplished by using trains. It would be impossible to transport this apparatus by train and use it efficiently. The radio inspection service of the Department of Commerce is performing all of the field work required by the Federal Radio Commission which is given certain administrative authority under the Radio Communications Law of 1927. This field work is directed through the Radio Division of the Department of Commerce.

The Federal Radio Commission

A Survey of its Accomplishments

By G. F. Wisner,

Director of Publicity, Federal Radio Commission



HE Federal Radio Commission was created by an act of Congress, approved February 23, 1927, to deal with a condition in the radio broadcasting field which had become hopelessly involved during the months following July 3, 1926, when it became clear that the Department of Commerce had no authority under the 1912 Radio Law to allocate frequencies, withhold radio licenses, or regulate power or hours of transmission.

When Government control of radio stations broke down there were 528 stations broadcasting with little interference. New stations sprang up like mushrooms, so that by July 1, 1927, the number had increased to 671. Many stations jumped their waves and increased their power regardless of the rights of other broadcasters; even channels set aside under a gentleman's agreement "for the exclusive use of Canadian broadcasters" were appropriated by American broadcasters.

President Coolidge's Recommendations

In his message to Congress, December 7, 1926, President Coolidge recommended radio legislation, saying: "Due to the decisions of the courts, the authority of the Department under the Law of 1912 has broken down; many more stations have been operating than can be accommodated within the limited number of wave lengths available; further stations are in course of construction; many stations have departed from the scheme of allocation set down by the Department, and the whole service of this most important public function has drifted into such chaos as seems likely, if not remedied, to destroy its great value. I most urgently recommend that this legislation should be speedily enacted."

The Radio Act of 1927

Disturbances in the air by the broadcasters became so pronounced that the public became indignant and members of Congress were bombarded by protests requesting legislation to bring about relief. The Radio Act of February 23, 1927, creating the Federal Radio Commission, was the answer of Congress to the protests of listeners about the

chaotic condition in the air and was designed to bring order out of chaos.

The Radio Act of 1927 provided for an independent commission of five members, to be known as the Federal Radio Commission, to have absolute control of broadcasting and other radio activities for one year. Then the licensing authority was to revert to the Secretary of Commerce and the Federal Radio Commission was to act as a sort of Court of Appeals to hear protests of broadcasters who might take exceptions from the rulings of the Secretary of Commerce. (On March 28, 1928, Congress extended the life of the Commission one year, with full powers as a licensing authority.)

The First Radio Commission

Under the Radio Act of 1927 the Federal Radio Commission was formally organized on March 15, 1927, as follows:

Rear Admiral W. H. G. Bullard, of Media, Pa., Commissioner from the Second Zone, Chairman; Judge Eugene O. Sykes, of Jackson, Miss., Commissioner from the Third Zone; Orestes H. Caldwell, of New York, N. Y., Commissioner from the First Zone; Henry A. Bellows, of Minneapolis, Minn., Commissioner from the Fourth Zone, and Col. John F. Dillon, of San Francisco, Cal., Commissioner from the Fifth Zone.

Sam Pickard, Chief of the Radio Division, Department of Agriculture, was engaged as acting Secretary when the Commission was organized. Mr. Pickard was made permanent Secretary April 20, 1927. Each of the five commissioners took charge of the zone which he represented.

Changes in Commission Personnel

Mr. Bellows resigned as Commissioner November 1, 1927, and Mr. Pickard was appointed his successor by President Coolidge. Carl H. Butman, head of the Washington Radio News Service, was named successor to Mr. Pickard as Secretary of the commission.

Commissioner Dillon died in October, 1927, and Harold A. LaFount, of Salt Lake City, was named his successor

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How the Federal Radio Commission Brought Order Out of Chaos

By O. H. Caldwell,

Member of the Federal Radio Commission



T was about two years ago, in July, 1926, that Attorney General Sargent rendered his famous opinion holding that the Secretary of Commerce, under the old radio law of 1912, was without power to control the radio broadcasting situation or to assign wavelengths.

Immediately, control of the ether was off. Anarchy reigned in the broadcasting band.

Many stations at once "jumped" to new wavelengths which suited them better, quite regardless of the interference which they might thus be causing to other stations. Separation between law-abiding stations was destroyed by other stations' jumping in and camping in the middle of any open spaces they could find, each "jumper" impairing reception of three stations—his own and two others.

Thus, instead of the necessary fifty-kilocycle separation between stations in the same community, the condition soon developed where separations of twenty and ten and even eight, five and two kilocycles existed. Under such separations, of course, stations were badly blanketing each other, while listeners were assailed with scrambled programs—jazz, speeches and sermons often hopelessly mixed.

Canadian Waves Were Pirated

Wavelengths assigned to Canada were also violated in spite of repeated warnings from the Government and even personal appeals from members of the President's cabinet that national good faith and international good will were at stake. Meanwhile, two hundred and fifty new stations injected themselves into the already overcrowded situation and undertook to find perches on which to light, without respect to the existing stations. Some of the older stations also jumped their power, increasing five to ten times their output, and, as a result, delivering terrific heterodyne interference to distant stations that had been formerly undisturbed under the orderly radio pattern developed by the former supervising authorities.

Indeed, every human ingenuity and selfish impulse seemed to have been exerted to complicate the tangle in the ether.

On February 23, of last year, Congress passed the new Radio Law of 1927, putting great powers of radio control in the hands of a commission appointed by the President to serve full time for one year in clearing up the radio confusion. For the first sixty days of the law, or until April 23, no penalties were enforceable; but on April 24, when fines up to \$5,000 and penitentiary sentences up to five years became effective, the commission began its operations to clear out the interference.

The first steps taken by the commissioners were to transfer all stations to channels on even tens of kilocycles, to clear the Canadian waves, and to combine interfering stations and "tuck them in" wherever possible, in the spectrum, in order to keep them in operation without interfering with those

law-abiding stations who had remained faithfully on their assigned channels.

Repacking the Eighty-nine Channels

This was accomplished for the period of the temporary permits, which came to an end June 15. In the meantime, with the public given partial relief, it was possible for the commission to make a careful study of the situation, and by painstaking planning, make a re-allocation of all stations in the best interests of the listening public. When this re-allocation took effect, June 15, listeners at once found that, (1) for each locality local stations were well distributed along the dial, with minimum separations of 50 kilocycles; (2) stations have been recognized in terms of position and time, on the basis of their demonstrated capacity to serve the public; and (3) heterodyne interference between distant stations has been in general diminished.

These improvements were accomplished by repacking the channels according to an orderly plan, actually increasing the capacity of the 89 channels available, in much the same way that a lumber bin which appeared full—with lumber carelessly thrown into it from all directions—can hold considerably more when the lumber is packed in an orderly fashion and the former wasted open spaces avoided.

Sixty-day licenses were issued for June 15 to August 15, and again from August 15, and from October 15, and the operation of the new allocation was carefully watched in the light of actual experience during this period, so that necessary changes could be made where interference was experienced.

Irregular Radiation From Stations

Such actual experience is necessary in view of the irregular and unpredictable transmission which almost every station sends out. If the radiation of stations went out equally in all directions, making a station's interference area a circle, the task of fitting stations together without interference at minimum distances would be simple. But as every listener knows, some stations are unaccountably heard for many miles in one or more directions, while being shut off by natural "barriers" in other directions. Advantage must be taken of all these curious unpredictable phenomena, and adjustments made, before the new station set-up will be really working at its best. In this, only actual experience, and not even the soundest engineering theory, can be the guide. The commission is, therefore, likely to continue issuing only short-term licenses of 60 to 90 day duration from October 15, throughout the winter months, in order to test out the transmission conditions during the cold weather period of greatest effectiveness, before any long-term licenses are granted.

Meanwhile, definite policies for the further clearing of the broadcast band by the transfer of certain stations, as well as by denial of broadcasting licenses, were determined upon by the commission at its meeting of December 1, 1927.

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How the Radio Commission Cleared up the New York Wavelengths Following the Breakdown of the Law

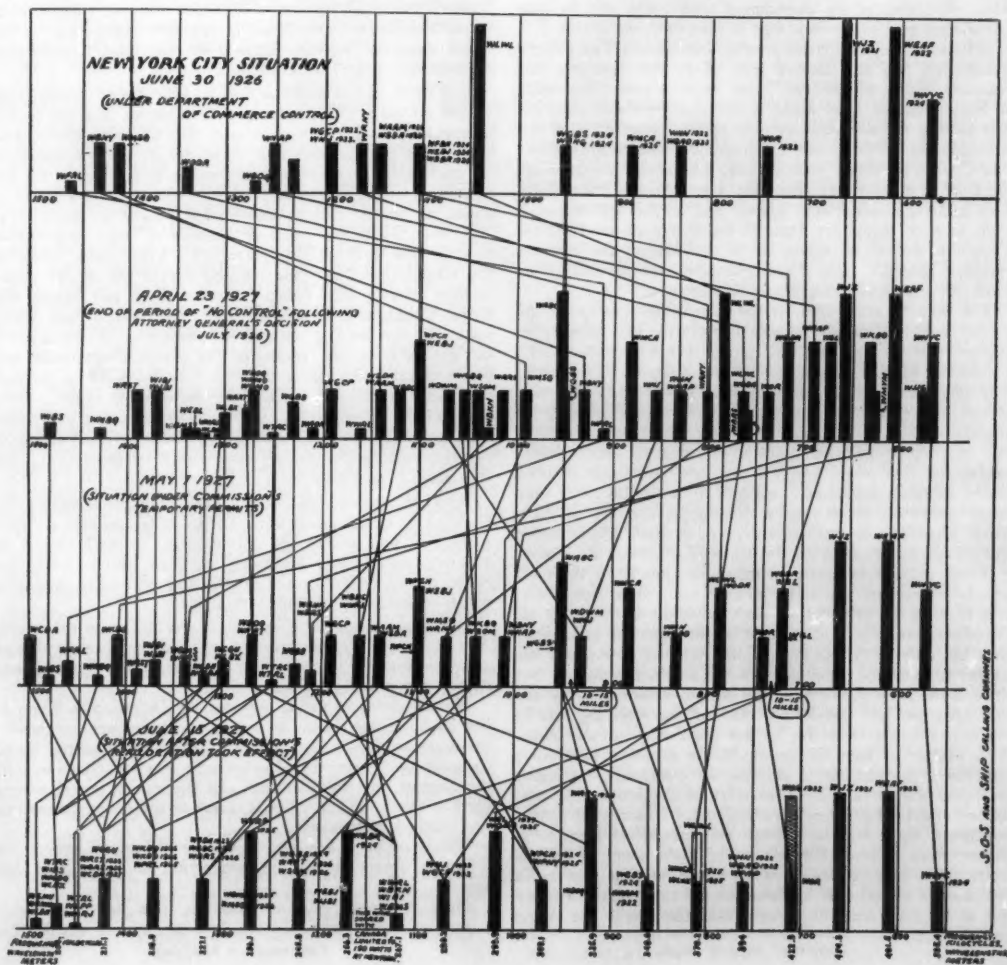


HE chart below, graphically depicting the clearing up of the New York radio situation, was prepared for THE CONGRESSIONAL DIGEST by Commissioner Caldwell. It serves as an accurate illustration of how muddled radio situations are being handled by the Radio Commission in all sections of the country.

The top line shows the situation on the New York radio listeners' dials during the period when Mr. Hoover had control of radio broadcasting, prior to the breakdown of the law. Note that the various stations are fairly well separated, so that interference was at a minimum.

The second line shows the result of eight months' of anarchy in the other lanes, without the restraining hand of government control. New stations had come onto the air and picked their own wavelengths. Old stations jumped their wavelengths, and increased their powers. The consequent confusion is indicated by the crowded condition of the spectrum. Favorite stations were badly interfered with by cross-talk and heterodyning. The situation shown for New York City was characteristic of the entire country.

The third and fourth lines show the two successive steps taken by the Commission in cleaning up the metropolitan spectrum. The first move was to make the wave-jumpers and new stations share time temporarily, while a careful study was being made of the merits and records of all the stations. This analysis completed, a new set-up was ordered, under which faithful and superior stations were moved up the scale, while less popular broadcasters who had taken advantage of the temporary absence of either police protection, were ejected from their undeserved positions, to places, dividing time, further down the dial.



Will the Davis Amendment Bring Better Radio?

Pro

Hon. E. L. Davis

U. S. Representative, Tennessee, Democrat



THE House Committee on Merchant Marine and Fisheries in reporting my amendment to the Radio Act of 1927 conceived the idea that the distribution clause in the 1927 law should be clarified, and, in fact, members of the Radio Commission themselves said that they would like to see it amended and clarified. So there resulted this amendment.

Various and specious arguments have been advanced against it. Perfectly frankly, we made the language or undertook to make it so clear and so unambiguous that there could be no misunderstanding and no misinterpretation. We wanted an amendment that could not be misunderstood and so we say that is necessary, especially if it is to be administered by the present commission. The present commission had not carried into effect the equitable distribution clause of the 1927 law, because under the spirit of it they should have made a fair and equitable distribution among the different sections of the country; they not only did not do that, but I charge, and the records show, that they affirmatively violated that provision, because when the 1927 law went into effect the first zone and New York City had far beyond their quota, and in this connection I want to state that every State in the first zone except New York was below its quota on a division of the existing national power. And yet the commission favored New York more than all other States and sections.

The records show that in the first zone there were 22 station applications for increased power. The power requested was 89,655, and the power granted was 81,905, and of the 81,000 granted, 60,500 of it was in New York. The other four zones had 55 applications for 185,650 watt power, and they were granted by this commission a total of only 45,110. In other words, the other four zones in this country applied for more than twice as much power as did the first zone, and yet the first zone was granted nearly twice as much increased power as all the other four zones combined, or putting it differently, the city of New York, according to these figures, was granted 15,000 more watts than was granted all the other 47 States in the Union.

There is little difference whether you put it on the total population or on the radio population. The first zone, that is given 37 per cent of the total national power in all the zones, has only 24.2 per cent of the receiving sets. The zone has only 17.68 per cent of the national power and has 21 per cent of the receiving sets. The third zone has but little more than one-fifth of the station power held by the first zone and yet has 16 per cent of the receiving sets in the entire nation and the largest population of any zone. As a matter of fact, the people in the southern zone have manifested a remarkable interest in purchasing as many receiving sets as they have, in view of the intolerable conditions under which they have suffered. If accorded proper treatment, there will be a large and immediate increase in the purchase of receiving sets in the third zone. I have a letter from a radio dealer in my State, stating that radio reception is so bad that he does not sell one-fourth as many sets as he did a year or so ago; that the people are trying to sell their sets.

Continued on next page

Con

Hon. Emanuel Celler

U. S. Representative, New York, Democrat



BELIEVE that the Radio Act, approved so recently as 1927 is ample to take care of all the ills and all the troubles that some members of the House are complaining about. The Radio Act of 1927 provided, briefly, that there shall be an equitable distribution of radio service in the various five zones. The country, as you know, is divided into five zones. Complaint has been heard on many sides that some of these zones have an insufficient amount of stations and station power. But I can see no reason why the Radio Commission should of necessity be blamed because some of the zones are deficient in that power, because you must reflect, that radio stations existed long before the Radio Commission sprang into being and the so-called disparity between sections of the country as to stations existed long before 1927.

We have had stations and they have been broadcasting on the air since 1920, seven years before we had the Radio Commission, and it is very strange that the complaint comes from those communities and States which did not establish or erect radio broadcasting stations in general prior to the enactment of the Radio Act. The predominating sections or zones, as far as stations and station power are concerned, are those which had men in them who were courageous enough and were willing enough to invest their funds in the establishment of these stations before the Radio Commission sprung into being. So we must not blame the Radio Commission if this difference or disparity has developed. It has been a natural development. From what I can gather from the reports of the Radio Commission and conversations with them, they have sought with might and with main to allow a natural development of radio. They have sought to allow the art of radio to spread and grow with as little unnatural restraint as possible, consistent with carrying out an "equitable distribution of service," as the Act of 1927 provided.

Now, the amendment which the committee made to the Senate bill, to my mind, will put the radio art into a strait-jacket; it will cramp its development; it will retard its progress, and instead of doing anything worth while for radio, it will make it more chaotic and will make confusion worse confounded. It will wreck radio.

It changes the idea of "equitable service" as in the parent Act, and says there shall be a numerical, mathematical, and equal division of broadcasting licenses, wave lengths, and station power among the five zones.

No discretion is given anyone; no discretion is given to the Radio Commission, as far as the zones are concerned; the language is mandatory, and I quite agree that the Radio Commission is given an administrative duty to divide equally the licenses, the wave lengths, and the station power among the five zones. Then when it comes to the zones themselves, the Radio Commission:

"Shall make a fair and equitable allocation among the different States thereof in proportion to population and area."

Now, if I may give an example, it is just like having a sort of large radio pie and endeavoring to divide that

Continued on next page

Pro

HON. E. L. DAVIS—*Continued*

The fourth zone has more receiving sets than the first zone, but much less power. So you can put it on either ground you please.

The argument that the application of this amendment, designed to insure a fair distribution of broadcasting licenses, wave lengths, and station power, will result in injury to the broadcasting situation, particularly the listening public in the New York City area, is wholly unfounded. Those opposing this equalization clause, led by the Radio Corporation of America and its affiliated interests, persistently disseminate the false statement that the station power in all the other zones under the provisions of this amendment would be reduced to the power now allocated to the zone with the lowest power. The amendment directs no such thing; nobody wants that done, and surely not even the present commission would be foolish enough to so administer the provision. The amendment authorizes and directs an equalization between the zones and a fair and equitable allocation within each zone in proportion to population. It is a perfectly fair and simple proposition.

As a matter of fact, the listeners in the highly congested areas are suffering more than anybody else. They can satisfactorily hear only a few of their very high-powered stations and no outside stations.

The matter of a fair and equitable allocation of broadcasting privileges throughout the country is not an "intricate and technical matter." It is a matter of national interest and right and involves a legislative policy. The amendment is not destructive but constructive. It does not undertake to tear down or to injure the broadcast structure, but to improve and build it up. To give the balance of the country outside of New York City and Chicago an equal deal in radio does not involve an injury to the broadcast situation in those cities.

The discrimination is not so much due to favoritism to cities or a section as it is due to class favoritism discrimination. What are the circumstances? We have in this country an iron-clad radio monopoly, according to the report and the charge of the Federal Trade Commission in a complaint now pending. This monopoly has more than one-third of all the station power in the country. They have the choicest wave lengths. Together with the affiliated stations they have 327,000-watt power as compared to 600,000 for all the balance of more than 600 stations.

The existing law divides the country into five zones by States. The first four zones are substantially equal in population, the zone I have the honor to represent being the largest of any of them. The fifth zone embraces the Pacific Coast and Mountain States, and although it has much less population than the other zones, yet it has nearly 50 per cent of the geographical area of the country, and in addition, that great section is divided by the Rocky Mountains, which constitute a serious static impediment.

We felt when we enacted the 1927 law that the fifth zone was entitled to as much consideration as the other four. So we treated them on an equal basis. Consequently, this amendment provides that there shall be an equal allocation between the different zones established in the act, and that there shall be a fair and equitable distribution among the States within a zone according to population. The zones are equal, but the States are unequal in population as well as area, and you could not apply the same yardstick to all the States. It is a simple proposition. It is workable. It is fair. It is American.—*Extracts See 1, p. 286.*

Con

HON. EMANUEL CELLER—*Continued*

radio pie into five equal parts and to give a one-fifth equal part to each of the five radio zones, as it were. Suppose you sit down to a table and there are children and adults at that table. I am sure you would not be very likely to give an equal piece of pie to the child as you would to the adult. I do not mean to imply that the zone three is necessarily like unto a child, but I will say this: That as far as industry, commerce, radio population, as far as enterprise is concerned with reference to broadcasting, and as far as willingness was concerned to enter this field—and facts are facts and you cannot change them—certain sections are not as fortunate as others. Some are smaller in all these items than others, through causes probably beyond their control. Because of these different conditions in the different zones it would be absurd to treat each zone in identical fashion. Because of these different conditions, and without any reflection upon any zone, you cannot give each zone an equal slice of the radio pie.

I am willing to do everything in my power to induce some of those States which were "backward in coming forward" with the erection of stations and the establishment of this greater-station power, to get what may be due them.

You might as well say that there are a certain number of telephones and telegraph facilities in this country and therefore you must divide the telephone and telegraph into five equal parts and divide them equally among five different zones, disregarding all of the peculiar conditions of industry, commerce, and so forth, that might obtain in the various five zones.

That is an absurd situation, but it is quite analogous to what this Davis amendment aims at. We might take all of the automobiles and all of the auto facilities and divide them into five equal parts and then say that those parts should be distributed equally among the various zones.

An important test as to what station power and as to the number of stations that should exist in a zone is not the actual population of the zone, but the radio population. I have figured the receiving sets in Zone 1, which is New York, New Jersey, Maryland, Delaware, District of Columbia, and New England, with the receiving sets of Zone 3, the Southern zone. Receiving sets are a good indication of radio population. Of the 554 total of stations, Zone 1 has 95 and Zone 3 has 88. Most of the complaining has come from Zone 3, yet on the basis of radio population New York would seem to be entitled to its 95 stations, with its radio sets of 1,440,100, in comparison to the 88 stations of Zone 3, with its radio sets of 1,037,950.

Although the actual population of Zone 3 is greater than Zone 1, the annual volume of radio business done in Zone 1 was \$26,209,000, while the annual volume of radio business done in Zone 3 was \$6,665,000. By radio business is meant the sale of radio stocks, including receiving tubes, rectifying tubes, dry batteries, storage batteries, sets, and so forth. These figures were compiled by the electrical equipment division, Bureau of Foreign and Domestic Commerce, at Washington, with the co-operation and assistance of the radio division, National Electrical Manufacturers' Association. They took the stock in the hands of radio dealers January 1, 1928, and compared it with stock in hands of radio dealers as of October 1, 1927.

Thus, Zone 3 sells less than 25 per cent of the radio stocks sold in Zone 1. That gives little cause for great complaint, if Zone 1 has more stations and more station power than Zone 3 it needs more because it has a larger radio population.—*Extracts see 2, p. 286.*

Will Reallocation Benefit the Public?

Pro

HON. WALLACE H. WHITE, JR.,

U. S. Representative, Maine, Republican



DO NOT like to talk and rave about monopolies, but there are some significant things to be observed. There are allocated to the stations in New York City, if we charge to this city those stations which have their studios there, in round numbers, twice the power allocated to the great Southern zone of 11 States. There is allocated to that city alone almost 37,000 watts more of power than to that great fifth zone, comprising half of the United States.

If you go into it further you will find that there are 12 stations owned by the General Electric, the Westinghouse, the Radio Corporation of America, and the National Broadcasting Company, which, speaking in terms of radio, constitute a single interest, and there are allocated to this interest 215,000 watts power, which is one-third of all of the power throughout the United States, one-third of all of the power allocated to, roughly, 675 stations. Talk to me about equity under this situation!

This is the situation which was brought to the knowledge of the Committee on Merchant Marine and Fisheries. And what were we to do about it? This amendment is the answer of the committee to this inequality, to this injustice. Where did this amendment spring from? What was the inspiration of the amendment? The chairman of the Federal Radio Commission, the only lawyer appointed, the only member confirmed, at the time, suggested to use that the proper construction of the law was that there should be a prorata quota among the States, and if that is not precisely what we have undertaken to do among the zones, then I do not know what language means. We have provided for the zones of this country an equal division of stations and power and wave lengths. We have stopped there and then have provided that within these zones there may be the exercise of discretion, that other elements may be taken into account, and that there shall be a fair and equitable distribution according to population. On that amendment I stand, and to that amendment I give my cordial support.

What is back of the opposition to this amendment? Strip it of everything, look at it in all of its hideous nakedness, and this is a fight by those who are in to stay in. This is an assertion on the part of those who oppose this amendment that they have vested rights. They are asserting a right above the obligation of Congress to legislate in behalf of the whole United States. They are asserting right to hold that which they first acquired. They are seeking to foreclose by their opposition to this amendment the future of this great southern zone, and they are seeking to foreclose the future of this great section of the country lying to the west.

Let me tell you that if you have only a local viewpoint, if your ears are attuned only to the call of selfishness, if you subscribe to the doctrine that any station has rights superior to the authority of this Government, if you are indifferent to inequality and injustice, if you can see a part only instead of the whole United States, you will be opposed to this amendment; but if you see this nation as a whole, if you visualize the American people as one people, and if you think of this United States of ours as a Union of sovereign and equal States, then you will support this amendment.—*Extracts see 3, p. 286.*

Con

HON. ROBERT H. CLANCY,

U. S. Representative, Michigan, Republican



HIS amendment is a radical departure from the purpose of the 1927 law. Congress, by the language in the 1927 law, undertook to insure, as far as possible, equitable radio service to the listening public in every section of the country. The right to operate a broadcasting station depended on the wishes of the listening public.

The amendment asserts an entirely different theory as a basis for granting a broadcast license. It requires that each zone shall have an equal number of stations, an equal amount of power, and an equal number of waves or channels. The citizens of each zone have no choice. They must take these stations, power, and waves, and the power of each of the zones must be equalized every 90 days, which is the license period specified by this amendment. The unavoidable result will be that the uniform number of stations, power, and waves will be controlled by the zone having the least number of stations, power and waves. It cannot be otherwise because the law will require an equality, and there is nothing in the law which permits the forcing of an increase in number of stations or the power to be used. The number can be decreased or power decreased, but not increased. This means that four of the five zones must be cut in stations and power.

The desires or the will of the listening public in any zone is not a factor to be considered in determining the number of broadcast stations they shall have. The ability to obtain acceptable material for a continuous broadcast program is not a factor which can be considered. Each zone must have an equality of stations, power and waves. If the listening public is more anxious to have a broadcasting station located in their community than it is in the character of program it receives, then they should favor the amendment, because it provides for equal number of stations; but if the public is more anxious to have a variety of good programs from stations capable of getting material and talent to make a good program, then the public should oppose this amendment. They must choose, because they cannot have both if this amendment becomes a law.

Members of Congress who favored this amendment argued that it gives to each section of the country an equality of stations, power, and waves and such an arrangement will not interfere with the reception of distant stations. All it will do is to cut down the number of distant stations in order that you may have your own local radio stations, the same as the people in the larger centers. This sounds attractive, but not a single Congressman who takes this position ever operated a broadcasting station in his life, knows comparatively little of the practical side of broadcasting, and his promise is the mere guess and hope of an uninformed person as to what will happen if his scheme is tried.

This amendment means that millions of people throughout the country will not be able to get any of the larger stations which may have been their favorites. It means that millions of listeners who have enjoyed the remarkable talent of Chicago, New York and the other large cities must give up this luxury and accept the local talent of their respective communities.—*Extracts see 4, p. 286.*

Are Large Broadcasting Stations Violating the Radio Law?

Pro

RADIO PROTECTIVE ASSOCIATION



WHEREAS, the Radio Act of 1927 makes it unlawful for the holder of a broadcasting license, or any person, firm or corporation owning an interest in a radio station, to own or control any interest of any kind in a telephone, telegraph or cable company, whenever such ownership or control may substantially lessen competition, restrain commerce or tend to create a monopoly; and

WHEREAS, the General Electric Company owns stations WGY at Schenectady, N. Y., KOA at Denver, Col., and KGO at Oakland, Cal.; the Westinghouse Electric and Manufacturing Company owns stations KDKA at Pittsburgh, Pa., KYW and KFKX at Chicago, WBZ at Springfield, Mass., and WBZA at Boston, Mass.; the Radio Corporation of America owns stations WJZ at Bound Brook, N. J., and WRC at Washington, D. C.; and said General Electric Company, Westinghouse Electric and Manufacturing Company and Radio Corporation of America jointly own the National Broadcasting Company, which owns and operates Station WEAf at Bellmore, N. Y.; and

WHEREAS, said General Electric Company, Westinghouse Electric and Manufacturing Company, and Radio Corporation of America control an interest in the radio patents owned by the American Telephone and Telegraph Company, under agreements exposed on the floor of both Houses of Congress, which notoriously lessen competition and restrain commerce, and whose purpose and effect it is to create a monopoly in the manufacture of radio apparatus; and

WHEREAS, said Stations WGY, KDKA, WJZ and WEAf are the largest radio stations in the United States, with an allotment of 180,000 watts, or almost one-third the power allotted to all the radio broadcasting stations in the United States; and

WHEREAS, it was because of this disproportionate allotment to a few stations owned by the Radio Trust that Congress ordered the Federal Radio Commission to make a reallocation of broadcasting licenses and said Commission is now engaged in making such reallocation; and

WHEREAS, the Radio Law has given power to said Radio Commission to revoke the licenses of violators of any of the provisions of said Radio Law, and such revocation of the licenses of high-powered stations would eliminate the necessity for discriminating further against the independent radio stations of the country; therefore, be it

Resolved, By the Radio Protective Association that it demand that said Federal Radio Commission enforce the mandate of the Radio Law and revoke the broadcasting licenses of said Stations WGY, KOA, KGO, KDKA, KYW, KFKX, WBZ, WBZA, WJZ, WRC and WEAf.

—Extracts, see 5, p. 286.

Con

LOUIS G. CALDWELL

General Counsel Federal Radio Commission



IT IS necessary to determine whether the facts charged by the Radio Protective Association are such as to constitute a violation or failure to observe the restrictions of Section 17. In my opinion, they clearly do not constitute such a violation or failure to observe.

The acts are prohibited only when the purpose or effect may be substantially to lessen commerce or to restrain commerce between any place in the United States and any place in any foreign country, or unlawfully to create monopoly in any line of commerce. The very evident intention of the section was to prohibit such a combination of wireless or radio communication interests with other forms of communication interests (such as cable, wire, telegraph or telephone) as substantially to lessen competition or create monopoly in the field of communication.

The stations concerned in our present inquiry are all broadcasting stations engaged in furnishing the public with various types of programs, chiefly entertainment. There is no point-to-point communication; it is entirely uni-lateral. While the programs of these stations are undoubtedly heard beyond the borders of the United States, and while the interference range extends regularly into portions of the earth not within the jurisdiction of the United States, still there is no communication from foreign countries to these stations. They do not compete with any cable, wire, telegraph or telephone line or system.

The Radio Protective Association does not assert that there is any such substantial lessening of competition between the various types of companies engaged in foreign communication. Instead, it asserts that there are certain agreements between the General Electric Company, Westinghouse Electric and Manufacturing Company and the Radio Corporation of America, having to do with the control of radio patents. I have no hesitation in asserting that even if the charge be true, Section 17 does not cover the creation of "a monopoly in the manufacture of radio apparatus." Such a monopoly must be dealt with under the provisions of the anti-trust laws and under Sections 13 and 15 of the Radio Act of 1927. If there is a monopoly, it is not increased by the licensing of a station nor is it lessened by revoking the license of a station.

The resolution of the Radio Protective Association also makes charges on the basis of the present power allotment of broadcasting stations. These charges are difficult to follow. They are, of course, based upon misunderstanding of the effect of high power, and represents the views of those who are not familiar with principles of engineering. When the resolution states that the "revocation of licenses of high-power stations would eliminate the necessity for discriminating further against the independent radio stations of the country," it is proceeding on a hypothesis and drawing a conclusion which, according to radio engineers, are not correct. This, however, has to do more with radio engineering than with law.—Extracts, see 6, p. 286.

CALL LETTERS	LOCATION	OWNER	TIME DIVISION	POWER	CALL LETTERS	LOCATION	OWNER	TIME DIVISION	POWER
730 Kilocycles: (CANADIAN EXCLUSIVE)					KGBZ York, Nbr.				
740 Kilocycles—405.2 Meters:					Federal Live Stock Remedy Co.				
WSB	Atlanta, Ga.	Atlanta Journal Co.	(C. P. 5000)	1000	KMA	Shenandoah, Ia.	May Seed & Nursery Co.	KMA	500
KMMJ	Clay Center, Nebr.	The M. M. Johnson Co.		1000†	KFWI	Oakland, Calif.	Oakland Educa. Society	KGBZ	500
750 Kilocycles—399.8 Meters:					KFWI	San Francisco, Cal.	Radio Entertain., Inc.	KFWI	500
WJR-WCX	Pontiac, Mich.	WJR, Incorporated		5000	Stations KGES, KGBY, KGCH, KGEO and KGDW to combine as KGBZ.				
760 Kilocycles — 394.5 Meters:					940 Kilocycles — 319.0 Meters:				
*WJZ	New York, N.Y.	Radio Corp. of America		30,000	WCSH	Portland, Maine	Congress Sq. Hotel Co.		500
WEW	St. Louis, Mo.	St. Louis University		1000†	WFIW	Hopkinsville, Ky.	The Acme Mills, Inc.		1000
770 Kilocycles — 389.4 Meters:					KOIN	Portland, Ore.	Drivers Journal Pub. Co.		1000
KFAB	Lincoln, Nebr.	Nebraska Buick Auto Co.	WBBM-WJBT	5000	KGU	Honolulu, H.T.	Marion Mulrony		500
WBBM	Chicago, Ill.	(2 stations to consolidate)	KFAB	10,000	950 Kilocycles — 315.6 Meters:				
780 Kilocycles — 384.4 Meters: (CANADIAN SHARED)					WRC	Washington, D.C.	Radio Corp. of America		500
WBSO	Wellesley Hills, Mass.	Babson's Stat. Org., Inc.		100†	KMBC	Independence, Mo.	Midland Bldg. Co.	WHD	1000
WSEA	Portsmouth, Va.	Va. Bldg. Co., Inc.	WTAR-WPOT	500	KLDS	Kansas City, Mo.	Sweeney Auto Sch. Co.	KMBC-KLDS	1000
WTAR	Norfolk, Va.	Reliance Elec. Co., Inc.		500	KFWB	Los Angeles, Calif.	Warner Bros. Bldg. Co.	KFSN	1000
WMC	Memphis, Tenn.	Memphis Comm. Appeal, Inc.		500	KFSN	Pasadena, Calif.	Pasadena Star-News Publishing Co.		1000
KELW	Burbank, Calif.	Earl L. White	KNRC	500	KGHL	Billings, Mont.	N. West Auto Sup. Co.		500
KNRC	Santa Monica, Cal.	Pickwick Bldg. Corp.	KELW	500	960 Kilocycles: (CANADIAN EXCLUSIVE)				
790 Kilocycles — 379.5 Meters:					970 Kilocycles — 309.1 Meters:				
*WGY	Schenectady, N.Y.	General Electric Co. (limited time)		50,000†	WOC	Davenport, Ia.	Palmer Sch. of Chiroprac.	WSUI	5000†
WGO	Oakland, Calif.	General Electric Co.		10,000	WSUI	Iowa City, Ia.	State Univ. of Iowa	WOC	500†
800 Kilocycles — 374.8 Meters:					KJR	Seattle, Wash.	N. West Radio Ser. Co.		500†
WBAP	Ft. Worth, Tex.	Carter Pub. Inc. (C. P. 50,000 w.)	KTHS	5,000	980 Kilocycles—305.9 Meters				
KTHS	Hot Springs, Ark.	Arlington Hotel Co.	WBAP	5000†	990 Kilocycles — 302.8 Meters:				
810 Kilocycles — 370.2 Meters:					WBZ	E. Springfield, Mass.	Westinghouse E & M Co.	WBZA	15,000
WPCH	New York, N.Y.	Concourse Radio Corp.		500†	WBZA	Boston, Mass.	Westinghouse E & M Co.	WBZ	500
WCCO	Minneapolis, Minn.	Washburn-Crosby Co.		10,000	KSOO	Sioux City, S.D.	Sioux Falls Bldg. Assn.		1000†
820 Kilocycles — 365.6 Meters:					1000 Kilocycles — 299.8 Meters:				
WWJ	Detroit, Mich.	The Detroit News		1000	KYW-	Chicago, Ill.	Ill. Pub. & Print. Co.		5000
830 Kilocycles — 361.2 Meters:					KFKX	Glendale, Cal.	Frederick Robinson		250†
KOA	Denver, Colo.	General Electric Co.		12,500	KGPH	Glendale, Cal.			
840 Kilocycles: (CANADIAN EXCLUSIVE)					1010 Kilocycles — 296.6 Meters: (CANADIAN SHARED)				
850 Kilocycles — 352.7 Meters:					WQAO-	New York, N.Y.	Calvary Baptist Church	WHN-WRNY	250
KWKH	Kennonwood, La.	W. K. Henderson	WWL	5000	WPAP	New York, N.Y.	George Schubel	WQAO-WPAP-	
WWL	New Orleans, La.	Loyola University	KWKH	5000†	WHN	New York, N.Y.	Experimenter Pub. Co.	WRNY	250
KFQZ	Hollywood, Calif.	Taft Radio & Bldg. Co., Inc. (L'd. time)		250†	WRNY	New York, N.Y.		WQAO-WPAP-	
860 Kilocycles — 348.6 Meters:					KRGV	Harlingen, Texas	Harlingen Music Co.	KWWG	500
WABC-	New York, N.Y.	Atlantic Broadcasting Co.		5000	KWWG	Brownsville, Texas	Chamber of Commerce	KRGV	500
870 Kilocycles — 344.6 Meters:					WREN	Lawrence, Kans.	Jenny Wren Co.	KFKU-KSAC	500
WLS	Crete, Ill.	Sears-Roebuck & Co.	WENR-WBCN	5000	KFKU	Lawrence, Kans.	University of Kansas	WREN-KSAC	500
WENR-	Chicago, Ill.	Great Lakes Radio Broadcasting Co.		5000	KSAC	Manhattan, Kans.	Kans. State Agri. College	WREN-KFKU	500
880 Kilocycles — 340.7 Meters: (CANADIAN SHARED)					KQW	San Jose, Calif.	First Baptist Church		500
WQAN	Scranton, Pa.	Scranton Times	WGBI	250	KPOF	Denver, Colo.	Pillar of Fire, Inc.	KFKA	500
WGBI	Scranton, Pa.	Scranton Bldg. Co., Inc.	WQAN	250	KFKA	Greeley, Colo.	Colo. State Teachers Col.	KPOF	500
WCOB	Columbus, Miss.	Crystal Oil Co.		500	1020 Kilocycles — 293.9 Meters:				
890 Kilocycles — 336.9 Meters: (CANADIAN SHARED)					WHAS	Louisville, Ky.	Courier Journal & Louisville Times	WWVA	5000†
WJAR	Providence, R.I.	The Outlet Co.	WGST	250	WWVA	Wheeling, W.Va.	W. Va. Bldg. Corp.	WHAS	250†
WMAZ	Macon, Ga.	Mercer University		500	1030 Kilocycles: (CANADIAN EXCLUSIVE)				
WGST	Atlanta, Ga.	Ga. Sch. of Technology	WMAZ	500	1040 Kilocycles — 288.3 Meters:				
WNAX	Yankton, S.D.	Gurney Seed & Nur. Co.		500	WKAR	E. Lansing, Mich.	Michigan State College		500†
KUSD	Vermillion, S.D.	University of S. Dakota	KFNFIKUSD	500	*WFAA	Dallas, Texas	Dallas Morning News	KRLD	5000†
KFNFI	Shenandoah, Ia.	Henry Field Seed Co.	WNAX-KUSD	500	KRLD	Dallas, Texas	KRLD, Inc.	*WFAA	5000†
900 Kilocycles — 331.1 Meters:					1050 Kilocycles — 285.5 Meters:				
WFBL	Syracuse, N.Y.	The Onondaga Co., Inc.	WMAK	750	WHO	Des Moines, Iowa	Iowa Bankers Life Co. (Ltd. Time)	WOI	5000†
WMAK	Martinsville, N.Y.	WMAK Bldg. Sys., Inc.	WFBL	750	WOI	Ames, Iowa	Iowa State College (Ltd. Time)	WHO	5000†
WKY	Oklahoma City, Okla.	WKY Radiophone Co.		1000	KNX	Hollywood, Calif.	Western Bldg. Co.		5000
WLBL	Stevens Point, Wis.	Wis. Dept. of Markets		1000†	1060 Kilocycles — 282.8 Meters:				
KHJ	Los Angeles, Calif.	Don Lee, Inc.		1000	WBAL	Baltimore, Md.	Cons. Gas Elec. Light & Power Co.	WTIC	5000
KFQD	Anchorage, Alaska	Anchorage Radio Club		100	*WTIC	Hartford, Conn.	Travelers Ins. Co. (C. P. 50,000)	WBAL	500†
910 Kilocycles: (CANADIAN EXCLUSIVE)					1070 Kilocycles — 280.2 Meters:				
920 Kilocycles — 325.9 Meters:					WTAM	Cleveland, Ohio	WTAM & WEAR, Inc.	WEAR	3500
WSET	South Bend, Ind.	South Bend Tribune	WFBM	500	WEAR	Cleveland, Ohio	WTAM & WEAR, Inc.	WTAM	1000
WFBM	Indianapolis, Ind.	Indianapolis Fr. & Ld. Co.	WSBT	1000	WCAZ	Carthage, Ill.	Carthage College	WDZ	100†
KUOM	Missoula, Mont.	State University of Mont.	KHQ	500	WDZ	Tuscola, Ill.	James L. Bush	WCAZ	100†
KHQ	Spokane, Wash.	Louis Wamser, Inc.	KUOM	1000	1080 Kilocycles — 277.6 Meters:				
930 Kilocycles — 322.4 Meters: (CANADIAN SHARED)					WBT	Charlotte, N.C.	C. C. Coddington (C. P. 10,000)	WPTF	5000†
WIBG	Rhine Park, Pa.	St. Paul's P. E. Church		50†	WPTF	Raleigh, N. C.	Durham Life Ins. Co. (C. P. 10,000)	WBT	5000†
WDBJ	Roanoke, Va.	Richardson-Wayland Elec. Corp.	WBBX	250	1090 Kilocycles — 275.1 Meters:				
WBBX	Roanoke, Va.	Richmond Dev. Corp.	WDBJ	250†	KMOX	St. Louis, Mo.	Voice of St. Louis, Inc.		5000
WBBC	Birmingham, Ala.	Birmingham Broadcasting Co., Inc.		500	1100 Kilocycles — 272.6 Meters:				
					WPG	Atlantic City, N.J.	Munic. of Atlantic City	WLWL	5000
					WLWL	New York, N.Y.	Missionary Society of St. Paul the Apostle	WPG	5000

6 P. M. to 5 P. M.

[illegible]

Aftermath of Reallocation

Comments of Radio Experts and Press on the Federal Radio Commission's Order

Brooklyn Dissatisfied

The Federal Radio Commission, privately, figured that when Brooklyn was assigned 214 meters in the broadcast spectrum, the howls and groans from the borough would be heard all the way to the Potomac—and that is just what is happening. Brooklyn stations will get a hearing with a view to revision of the line-up and better news comes in the report that Chairman Ira Robinson, H. A. LaFount and O. H. Caldwell are inclined to feel badly about relegating Brooklyn into the ashcan.

Certainly the announcement was contrary to all reports. All the information was to the effect that Brooklyn would get one good wave-length, despite the fact that it was served most satisfactorily by the big broadcasters whose studios are located in Manhattan.

Borough prestige and pride get terrific pin pricks by this latest ruling of the commission, and if there is not general indignation in every square inch of Brooklyn territory, the much touted home community has lost its civic ginger. And that's regardless of the fact whether you like the local stations or not.—*Eric Palmer in Brooklyn Daily Times, September 12, 1928.*

On the Right Track

The Commission declares that it has divided the channels of communication so as best to serve the public as a whole. It has ordered many changes, abolished many stations and curtailed the privileges of many others, as only drastic reorganization could bring order out of the chaos into which broadcasting was rapidly drifting. It would be too much to expect that the commission has succeeded in achieving all that it hoped to accomplish, but there is reason to believe that the new regulations will demonstrate their usefulness in practice. They should be given a fair trial.

On the main question—service to the people as a whole—Government experts are convinced that they are on the right track. That is the consideration which should govern the commission.—*Baltimore Sun, Editorial, Sept. 12, 1928.*

An Experimental Period

The new allocation has been in the process of development for a year, and, in the judgment of the commission and its engineers, will place radio reception on a higher plane than it ever before enjoyed. The effect of such a drastic change in broadcasting conditions, however, cannot be accurately measured until the new frequency assignments become effective and broadcasting passes through a new experimental period.

While the commission has failed to recognize Washington as a national broadcasting center, placing WRC in the category of a "regional" instead of a "national" station, it nevertheless yielded to popular demand and allowed this station full time.—*Editorial, Washington Evening Star, Sept. 11, 1928.*

A Drastic Rearrangement

The new allocation made by the Radio Commission is a very drastic rearrangement of air privileges. It involves many problems of radio engineering and doubtless will arouse numerous protests. And doubtless many of these protests

will be justified. The members of the Commission are said to be at wide variance over the orders issued. Broadcasters and the public will prove as capable of diversity of opinion.

The order most susceptible of criticism by the public is that which limits the broadcasting of New York programs to an hour each evening. In the first place, the action of the Radio Commission in thus restricting programs seems meddling. The best programs come from New York. They are prepared at great expense by two systems, the Columbia and the National. The Radio Commission's order may have the effect of putting one or both of these broadcasting systems out of business. They depend greatly on their aerial "circulation" for financial returns.

The order limiting these New York programs to one hour each evening is said to be founded on a desire that programs be diversified. New York is more capable of furnishing diversity of programs than are local studios. Suppose that some national board, clothed with sufficient power, should order that the Grand and Shubert Theaters in Cincinnati devote only four nights a week to companies emanating from New York, and that three nights be used by local companies. The order would put both the theaters and the New York companies out of business. The Radio Commission's order will have similar effect. The broadcasting systems will not be able to give the quality of programs now being given, if the systems continue to exist at all, and the radio dealer will feel the effect upon a public to whom radio programs shall have been made far less attractive.—*Editorial Cincinnati Times Star, September 12, 1928.*

A Great Step Forward

"In analyzing the new allocation, two factors must be borne in mind, first, that the information before the commission is much more complete than any individual can have, and second, that it is the combined service that the entire list of stations will give rather than the individual service of any one station which the commission had to consider.

"For over three years the public and the radio industry have waited for the benefits of proper Federal regulation. Reviewed from the national angle there can be no question but that every listener in the land will have vastly better radio service than he has ever known before. The new allocations are a courageous and sincere effort to solve one of the most perplexing problems that ever faced a Federal body, and they deserve and undoubtedly have the full co-operation of the broadcasters.

"There were several errors in the original list and there were probably other cases where a better adjustment can be made, but the commission shows every willingness to take care of these difficulties. By and large, it is the greatest single step forward that radio has ever taken.—*R. H. Langley, of Cincinnati, director of engineering, Crosley Radio Corporation, Washington Post, Sept. 16, 1928.*

The Luck of Superior, Wis.

It looks as if the proverbial Coolidge luck will be shared by Station WEBC at Superior, Wis. Prior to the President's sojourn on the Brule, this station was comparatively

unknown, but in order to favor the Chief Executive of the Nation during his summer vacation, WEBC was temporarily allowed, by Judge Ira E. Robinson, chairman of the Federal Radio Commission, to increase its power from 250 watts to 1,000 watts. Its record apparently made such a favorable impression upon the Commission that under the new reallocation, the 1,000-watts power will be made permanent.—*Robert D. Heintz in the Washington Post, Sept. 16, 1928.*

"Out on a Limb"

Faced with the order issued by the Commission that power be limited to 25,000 watts, excepting for experimental purposes, several broadcasters throughout the country who are either constructing or have built under construction permits granted by the Commission 50,000-watt stations seem to be "left out on a limb."

This includes Station WENR at Chicago, KTHS, Hot Springs, Ark., and WTIC, Hartford, Conn. A construction permit has also been granted KFI at Los Angeles for 50,000 watts but it is reported that this request has been allowed to lapse by the owners of the station.

A Chicago station which will be hard hit by the reallocation of wave lengths is WHT, in which Mayor William Hale Thompson is interested, and over which all of Mayor Thompson's political propaganda goes out. It will have a much less desirable frequency, having been changed from 980 kilocycles (305.9 meters) to 1,470 kilocycles (204 meters). The station will still be permitted to broadcast on 5,000-watts power the same as before, but instead of dividing time with one station, it will have to divide with three.—*WJAZ, WORD and WIBO, Chicago.—Robert D. Heintz in the Washington Post, Sept. 16, 1928.*

The Northwest "Up in Arms"

The consensus is that the Northwest got a raw deal. This vast agricultural section is practically without radio service under the new reallocation plan. Chicago with no need for national channels has a virtual monopoly. Our people as well as several organizations in the Northwest are all up in arms.—*Stanley E. Hubbard, of St. Paul, Minn., Station KSTP.*

A Puzzle

Here is a puzzle that I cannot understand; the announcement of the commission says: "The reallocation plan provides for full time assignments for 100-watt stations equaling in

number the total of all other classes of broadcasters put together." Thereupon it explains that there will be 150 full-time positions for 100-watt stations, 125 for regional stations and 40 for 5,000-watt stations. This would make a total of 165 against 150. As a matter of fact the detailed listing shows 44 full-time positions for 5,000-watt stations. Can you account for this discrepancy, or is the Federal Radio Commission trying to deceive itself?—*Orwald F. Schuette, Chicago, Secretary Independent Broadcasters Association in Washington Post, Sept. 16, 1928.*

Improved Service

I consider the new allocation plan to embrace admirable principles and to permit an orderly arrangement of broadcast stations that will not only meet a strict interpretation of the requirement of equal division of facilities among the five zones, but also will give to the broadcast listeners throughout the country a vast improved service.—*John V. L. Hogan, Radio Consulting Engineer, New York City, in Washington Post, Sept. 16, 1928.*

Commissioner LaFount's View

The new plan and allocation will not produce perfection, but I most sincerely believe the results will be all that is possible, considering the number of stations necessary to accommodate, their location, the requirements of the law, and the limited number of channels available.—*Federal Radio Commissioner Harold A. LaFount, of the Western Zone.*

Farmers Will Gain

It is noteworthy that, while all classes of listeners benefit under the new allocation, the farmers will be the chief gainers. They will not only be able to receive more stations reliably without interference, but practically all points on the radio dial will be free from the curse of heterodyne whistles. The city listeners will gain through heterodyne-free reception of their various local stations and also reception of distant stations free from interference.—*Dr. J. H. Dellinger, Chief Engineer of the Federal Radio Commission.*

Will Enjoy Best Radio

We believe that when this plan is properly working, and the stations have had sufficient time to properly maintain their frequencies under it, the entire country will enjoy the best radio reception it has ever had.—*Judge E. O. Sykes, Vice Chairman of the Federal Radio Commission.*

A Glossary of Radio Terms

By Dr. J. H. Dellinger,

Chief Engineer, Federal Radio Commission

Absorption Modulation: The process of varying the amplitude of a radio-frequency alternating current in accordance with any desired wave form by systematically absorbing energy from the alternating current circuit in an element of a circuit which serves as an appropriately variable resistance. For example: Using the plate circuit of a three-electrode tube as a variable resistance and varying such resistance by means of suitable voltages impressed on the grid; or, by coupling such a variable resistance to the antenna circuit of a radio transmitting set.

Admittance: The inverse of inductive reactance, i. e., $1 \div (6.28 \times \text{frequency} \times \text{inductance})$.

Air Condenser: A condenser having air as its dielectric, together with a minimum of solid dielectric used as mechanical support.

Alternating Current: Current which periodically reverses its direction of flow in a circuit.

Alternating Current Characteristic: The relation given by the curve obtained when the impressed emf. is plotted as abscissas against the resultant current as ordinates for alternating emf. and current.

Alternation: One-half a complete cycle; that part of a cycle during which the current flow is in one direction. See cycle.

Ampere: The unit of current. One ampere flows in a d.-c. circuit whose resistance is one ohm, when an electromotive force of one volt is present in the circuit.

Ampere-hour: The product of the current in a circuit and the number of hours it flows. A unit of work or electrical energy.

Amplification Factor: The ratio of the change of instantaneous voltage between filament and plate to a small change of instantaneous voltage between filament and grid for a given constant plate current.

Amplifier: A device which modifies the effect of a local source of power in accordance with the variations of input power, and produces an increased output of power.

Amplitude: The maximum ordinate of an alternating current or voltage characteristic; the maximum value the current or voltage attains during a cycle.

Antenna: A device for radiating or absorbing radio waves.

Antenna Resistance: An effective resistance which is numerically equal to the ratio of the average power dissipated in the entire antenna circuit to the square of the effective current at the point of maximum current.

Note—Antenna Resistance includes: Radiation resistance; ground resistance; radio-frequency resistance of conductors in antenna circuit and equivalent resistance of conductors in the antenna circuit; equivalent resistance due to corona, eddy currents, insulator leakage, dielectric loss, and so on. (See Effective Height of Antenna.)

Aperiodic Circuit: An electric circuit in which a voltage impulse will produce transient current in one direction only. The word aperiodic means "without period." Free oscillations are not possible in an aperiodic circuit.

Arc Transmission: The transmission of radio messages by continuous waves produced by an electric arc.

Atmosphere Absorption: Diminishing of the amplitude of electro-magnetic radiation due to absorption of energy by the atmosphere.

Attenuation: (Radio)—The decrease, with distance from the radiation source, of the amplitude of the electric and magnetic components constitutes an electro-magnetic wave.

Audibility: (Radio Telegraph)—A measure of the ratio of the telephone current producing a signal in a telephone receiver to that producing a barely audible signal. (A barely audible signal is one which permits the differentiation of the dot and dash elements of the letters.)

Audio Frequencies: The frequencies corresponding to normally audible sound waves. These lie below about 10,000 cycles per second.

Band of Wave Length: A continuous range of wave lengths extending between two definite wave lengths.

Beat Frequency: When two currents of slightly different frequencies flow simultaneously in a circuit, the best frequency is the difference between the two separate frequencies.

Buzzer Modulation: The process of varying the output power of a continuous-wave generator at the tonal frequency of a buzzer, either by: (a) using the buzzer as a chopper or audio-frequency interrupter in the output circuit of the generator, or a circuit suitably coupled thereto, or (b) using the buzzer element in a circuit of the continuous-wave generator which permits the ready control of the output power of the generator (e. g., the grid circuit of a three-electrode tube oscillator).

By-Pass Condenser: A condenser used to provide a path for alternating current around some circuit element through which current of high frequency cannot readily pass.

Capacity Coupling: The association of one circuit with another by means of capacity common or mutual to both.

Capacity Reactance: That part of the impedance which is due to the presence of capacity in the circuit and which is equal to $-1 \div (6.28 \times \text{Frequency} \times \text{capacity})$.

Capacity: The ratio of the quantity of electric charge in a condenser to the voltage across its terminals.

Cat-Whisker: The fine wire making contact with a crystal detector.

Choke Coil: A coil possessing great inductive reactance; used for preventing the flow of high-frequency currents into or out of oscillating circuits.

Chopper: A device used in transmitting circuits for modulating continuous-wave signals; also known as a "tikker."

Coil Antenna: An antenna consisting of one or more complete turns of wire.

Condenser: A device having capacity, consisting of insulating material (which may be air) between two conducting plates or sets of plates.

Condenser Antenna: An antenna consisting of two capacity areas. The lower capacity area may be ground or counterpoise.

Conductance: The inverse of resistance, i. e., $1 \div \text{resistance}$.

Continuous Waves: Continuous waves (CW) are a succession of waves of constant amplitude and frequency.

Continuous Waves, Key Modulated: Continuous waves of which the amplitude or frequency is varied by the operation of a transmitting key.

Continuous Waves, Modulated at Audio Frequency: Continuous waves of which the amplitude or frequency is varied in a periodic manner at an audible frequency.

Counterpoise: A system of wires or other conductors (not the ground) forming the lower plate of a condenser antenna.

Coupler: An apparatus which is used to transfer radio-frequency power from one circuit to another by associating together portions of these circuits. Couplers are of the same types as the types of coupling-inductive, capacitive and resistive.

Coupling Coefficient: The ratio of the mutual or common impedance component of two circuits to the square root of the product of the total impedance components of the same kind in the two circuits. (Impedance components are either resistance, capacity, or reactance.)

Current: The rate of flow of electricity in a circuit.

C. W.: Abbreviation for "continuous wave."

Cycle: A complete succession of events, during which the voltage or current in a circuit passes through all possible values. A complete set of positive and negative values of an alternating current.

Damped Alternating Current: A current passing through successive cycles or value with progressively diminishing amplitude, the average value being zero.

Decrement: The diminishing of the amplitude of successive free oscillations in an oscillatory circuit.

Detector: That portion of the receiving apparatus which, connected to a circuit carrying currents of radio frequency, and in conjunction with a self-contained or separate indicator, translates the radio-frequency power into a form suitable for operation of the indicator. This translation may be effected either by the conversion of the radio frequency power or by means of the control of local power. The indicator may be a telephone receiver, relaying device, tape recorder, and so on.

Dielectric: That portion of a condenser between the plates; it may be air or any non-conducting material.

Diode: A two-element vacuum tube, often used as a detector or rectifier; similar to the "Fleming Valve."

Direct Coupling: Association of two radio circuits by having an inductor, a condenser, or a resistor, common to both circuits.

Direct Current: Current which flows always in the same direction in a circuit; unidirectional.

Direct-Current Characteristic: The relation given by the curve plotted between the impressed electromotive force as abscissas and the resultant current as ordinates, for direct emf. and current.

Direction Finder: A radio receiving system which permits determination of the direction of the line of travel of received radio waves.

Directive Antenna: One having the property of radiating radio waves in larger proportion along some directions than others.

Double Modulation: The process of modulating a radio-frequency alternating current successively at two lower frequencies. The intermediate frequency is usually above the range of audio frequencies. The lowest frequency is generally an audio frequency or combination of audio frequencies, as in radio telephony.

Down Lead: That portion of a transmitting or receiving antenna which serves to connect the larger portion of an antenna or the main elevated conductor to the transmitting or receiving set, or through tuning inductors or condensers

to the ground connection or counterpoise system.

Duplex Signaling: The simultaneous transmission and reception of signals in both directions between two stations.

Dynatron: A three-electrode tube which depends for its action upon the liberation of electrons from an anode by electron bombardment.

Effective Emf.: In a.c. circuits, when the wave form of the voltage is sinusoidal, $\approx 0.707 \times$ maximum voltage occurring during the cycle.

Effective Height of an Antenna: The effective height of an antenna is a height somewhat less than the measured height, upon which the absorbing and radiating qualities of an antenna depend. This lessening of the apparent height is due to the presence of surrounding objects.

Electrolyte: The active liquid in a battery or electrolytic rectifier.

Electromotive Force (Emf.): Electric pressure; that force which tends to cause a current to flow. The unit of electromotive force is the volt, often referred to as the "difference of potential" between two points in the circuit.

Electron: The smallest component of matter which has been discovered. Regarded as the ultimate particle of matter, carrying a negative electric charge.

Electron Tube Rectifier: A device for rectifying an alternating current by utilizing electron flow between a hot cathode and a relatively cold anode in a vacuum.

Ether: A fictitious agency existing in space by means of which electro-magnetic waves are propagated.

The existence of the ether has been assumed for the purpose of aiding in the explanation of radiation phenomena.

Fading: A variation or diminution of the strength of received radio signals over prolonged, temporary or varying periods, caused by actual variation of wave intensity.

Farad: The unit of capacity. A condenser which holds one coulomb of electricity having a difference of potential of one volt between its terminals has a capacity of one farad.

The microfarad, which is one-millionth of the farad, is the unit generally used in radio calculations.

Feed-Back Coil: A coil designed to cause mutual action between the input and output circuits of an amplifying device, thereby increasing the amplification.

Feed-Back or Reaction Coupling (sometimes termed "TICKLER" Coupling): The process by which a part of the output power of amplifying device reacts upon the input circuit, thereby increasing the amplification.

Feed-Voltage Modulation: The process of varying the amplitude of a radio-frequency alternating current in accordance with any desired wave form by systematically introducing additional power into the circuit of the radio-frequency generator in accordance with the desired wave-form variations. In the three-electrode tube this involves systematically varying the supply voltage of the plate circuit.

Filter Band Pass: A combination of electric circuits which present low attenuation to alternating currents of all frequencies between certain limiting border frequencies and comparatively high attenuation to alternating currents of all frequencies below the low limiting border frequency or above the upper limiting border frequency.

Filter High Pass: A combination of electric circuits which present high attenuation to alternating currents below a certain frequency and comparatively low attenuation to currents above that frequency.

Filter Low Pass: A combination of electric circuits which present high attenuation to alternating currents above a certain frequency and comparatively low attenuation to currents below that frequency.

Flat-Top Antenna: An antenna having horizontal conductors at the top.

Forced Alternating Current: A current having a frequency and wave form which are equal to the frequency and wave form of the impressed electromotive force.

Free Alternating Current: A damped alternating current following a transient electro-magnetic disturbance in a circuit, with no external emf. acting.

Frequency: The number of complete cycles or half the number of reversals per second of direction of current flow of a wave, or in a circuit. The units in use are the cycle and the kilocycle (one thousand cycles).

Frequency Changer: A device delivering alternating current at a frequency which differs from the frequency of the supply current.

Full-Wave Rectifier: A rectifier so arranged as to rectify and render available all successive half cycles of an alternating current.

Fundamental of an Antenna: The lowest frequency of free alternating current in an unloaded antenna. (No series inductance or capacity.)

Grid Leak Resistor: (Usually called a grid-leak.) A resistor connected between the filament and the grid of a three-electrode tube used in association with a condenser to give the voltage between grid and filament a certain average negative value.

Ground Wire: A conductive connection to the earth.

Group Frequency: The number of trains of damped waves or current per second.

Note—The term "Group Frequency" replaces the term "Spark Frequency."

Harmonics: Multiples of the fundamental frequency which are often set up in a circuit; the introduction of these introduces elements into speech sounds which cause distortion. Part of the electrical energy is lost in setting up these harmonics. Harmonics which are present in the original speech sounds, however, must be preserved so that the quality is not altered.

Henry: The unit of inductance. One millionth of a henry, called the microhenry, is commonly used in radio calculations.

Heterodyne Reception: A method of radio reception for continuous waves, employing the principle of reaction between locally generated oscillations and incoming oscillations. (See Beat Frequency.)

Hot Wire Ammeter, Expansion Type: An ammeter dependent for its indications on the change in dimensions of an element heated by a current through it.

Hydrometer: An instrument for measuring the specific gravity of electrolytes in batteries.

Inductance: A property of conductors and circuits by virtue of which opposing emf's. are induced in them or in other nearby circuits, due to the magnetic fields set up by the current cutting across these circuits.

Impact Transmitter: A radio transmitting set in which the transfer of energy from the exciting to an oscillating circuit is effected during one pulse of the exciting circuit current.

Impedance: Ratio of voltage to current in an alternating-current circuit. Impedance is a factor determining the magnitude of current flow in a circuit. The greater the impedance for a given voltage the smaller the current.

Impulse Emf.: An emf., the maximum value of which is large compared with its average value, the average value being taken over a time equal to the time-constant of the circuit in which the emf. is impressed.

Impulse Excitation: A method of producing free oscillations in a circuit in which the duration of the impressed voltage is short compared with the duration of the current produced.

Inductive Coupling: The association of one circuit with another by means of inductance common or mutual to both. (This term when used without modifying words is commonly used for coupling by means of mutual inductance, whereas coupling by means of self-inductance common to both circuits is called "direct inductive coupling.")

Inductive Reactance: That part of the impedance which is due to the presence of inductance in the circuit, and which is equal to $6.28 \times \text{frequency} \times \text{inductance}$.

Input Reactance of a Three-Electrode Tube: The reactance of an electron tube to its input circuit, due to its electrode capacities. (See reactance.) The ratio of an alternating sine-wave input voltage to the portion of the resulting input current which is an alternating sine-wave current of the same frequency as the input voltage and ninety degrees out of phase with it.

Inductance: That property of an electric circuit by virtue of which a varying current induces an emf. in that circuit or in a neighboring circuit. Ratio of the magnetic flux to the current producing it.

Inductor: A conductor having inductance, usually a coil of wire.

Input Resistance of a Three-Electrode Tube: That part of the resistance of the input circuit of an electron tube which is due to the presence of the tube in the circuit. The ratio of an alternating sine-wave input voltage to that portion of the resulting input current which is an alternating sine-wave current of the same frequency as the input voltage and in phase with it.

Interrupted Continuous Waves: Interrupted continuous waves (ICW) are waves obtained by the modulation at audio frequency, during signaling, of an otherwise continuous wave.

Inverted L Antenna: A flat-top antenna in which the down lead is taken from one end of the horizontal portion.

Key: A device for closing and opening transmitting circuits in the act of transmitting signals.

Kenotron: A two-element electron tube highly evacuated, generally used for rectifying alternating currents.

Kilocycle: One thousand cycles.

Lead-In: See Down Lead.

Lightning Arrester: An instrument placed in antenna circuits to furnish an easy path to ground for lightning or other extremely high-voltage discharges.

Loading Coil: An inductor used to decrease the resonance frequency of an antenna or other circuit.

Logarithmic Decrement: The Napierian logarithm of the ratio of two successive current amplitudes in the same direction, for an exponentially damped alternating current. The logarithmic decrement can also be considered as a constant of a simple radio circuit, being — times the product of the resistance by the square root of the ratio of the capacity to the inductance of the circuit.

Loop Antenna: See Coil Antenna. Commonly used for a coil antenna of a single turn.

Loud Speaker: A device with or without special amplifying circuits, by means of which received sounds are made audible without the use of telephone receivers held to the ears.

Megohm: One million ohms. The unit of high resistance.

Meter: A unit of length, 39.37 inches.

Meter-Amperes: The product of the antenna current in amperes at the point of maximum current and the antenna height in meters for any radio transmitting station. It constitutes a factor for indicating the radiating strength of radio transmitting stations.

Microampere: One millionth of an ampere.

Microfarad: One millionth of a farad, a unit of capacity.

Microhm: One millionth of an ohm.

Micromicrofarad: One millionth of a microfarad, a convenient unit of capacity.

Microhenry: One millionth of a henry.

Milliampere: One thousandth of an ampere; a convenient unit in measuring small currents.

Modulation: Variation of amplitude of a radio-frequency current.

Modulation Frequency Ratio: The ratio of modulation frequency to wave frequency.

Multiple-Tune Antenna: An antenna with connections to ground through inductances at more than one point, the inductances being so determined that their reactances in parallel present a total reactance equal to that necessary to give the antenna the desired natural frequency.

Mutual Inductance: The inductive effect due to the proximity of two separate electrical circuits.

Ohm: The unit of resistance. The resistance of a d.-c. circuit when a current of one ampere flows under a difference of potential of one volt is one ohm.

Open Antenna: (See Condenser Antenna).

Oscillations: (In Radio Work.) See Damped Alternating Current.

Output Resistance of Three-Electrode Tube: That part of the impedance of the output circuit of the tube which is due to the presence of the tube in the circuit.

Parallel Resonance: When a single lumped capacity and a single lumped inductance are connected in parallel between terminals to which an alternating emf. is applied, and the inductance or capacity or frequency is varied, the condition of parallel resonance exists when the current supplied by the source is a minimum.

Every part of every actual circuit possesses a certain amount of distributed capacity and inductance, and in practice complex arrangements of a considerable number of inductances and capacities are often used. For this reason the assumption as to a single lumped capacity and a single lumped inductance made in the above two definitions are not strictly realized in practice, and the resonance conditions attained are a combination of series resonance and parallel resonance. This is particularly true in circuits of radio frequency in which the reactances due to leads and other parts of the circuit may be appreciable factors. (See Series Resonance.)

Period: The time of a complete cycle of alternating current or voltage; equal to two alternations.

Phase Difference: A quantity proportional to the power loss in a condenser or insulating material. Phase difference in degrees = $0.57 \times$ power factor in per cent.

Plate Condenser Antenna: A condenser antenna in which the capacity areas consist of wires or metal plates, both elevated well away from the ground.

Plate Current: The current passing between the plate and the heated cathode in a three-electrode tube.

Photron: A kymotron with an additional electrode called the grid, for controlling the output current.

Potentiometer: Known also as a "voltage divider." A resistance used for obtaining adjustable voltages by utilizing the voltage drop in the resistance.

Power Factor: In a.-c. circuits, the ratio of the power in watts to the volt-amperes, often expressed in per cent.

Pulsating Current: A periodic current (that is, current passing through the successive equal cycles of values), the average value of which is not zero. A pulsating current is the sum of an alternating and a direct current.

Radiation Efficiency: The radiation efficiency of an an-

tenna at a given wave length is the ratio of power radiated to the total power delivered to the antenna.

Radiation Resistance: The ratio of the total power radiated by an antenna to the square of the effective current at the point of maximum current.

Radio Channels: A band of wave lengths or frequencies of a width sufficient to permit of its use for radio communication without the radiation of subsidiary waves of more than a certain intensity at wave lengths of frequencies outside of such band.

Radio Frequencies: (See also Audio Frequencies.) The frequencies higher than those corresponding to normally audible sound waves.

Note:—It is implied that radiation cannot be secured at lower frequencies, nor that radio frequencies are necessarily above the limit of audibility.

Radiogoniometer: See Direction Finder.

Reactance: That part of the impedance of a circuit due to the inductance and capacity in it.

Rectification: Changing an alternating current into direct or pulsating current.

Rectifier: A device for rectifying alternating currents.

Regenerative Coupling: (See Feed-Back Coupling.) A receiving system designed to increase amplification in a three-electrode tube.

Resistance: The opposition offered to the flow of current in a circuit which manifests itself in the evolution of heat in the conductors.

Resistor: A device having resistance, used to introduce resistance into a circuit.

Resistive Coupling: The association of one circuit with another by means of resistance common to both.

Resonance: That condition of an a.-c. circuit under which maximum current flows for a given voltage. In a series circuit there is resonance when the inductive reactance is equal to the capacitive reactance.

Rheostat: A resistor with a means for varying the resistance, to control the flow of current in the circuit in which the rheostat is connected.

Self-Inductance: A property of wires and coils, due to the magnetic lines of force created by the current in the wire, cutting back on the wires and inducing an opposing emf. in them.

Self-Heterodyne: A system of reception of continuous wave signals by the production of audio-frequency beats through the use of a device which is both a radio-frequency generator and a detector of the audio-frequency beat currents produced.

Series Resonance: When a single lumped capacity and a single lumped inductance are connected in series between terminals to which an alternating emf. is applied, and the inductance or capacity or frequency is varied, the condition of series resonance (maximum current) exists when the inductive reactance equals the capacitive reactance. (See parallel resonance.)

Static: Static is conduction or charging current in the antenna system resulting from physical contact between the antenna and charged bodies (e. g., snowflakes) or masses of gas.

Stopping Condenser: A condenser used to provide direct-current insulation, but which permits alternating current to flow in a circuit.

Strays: Electromagnetic field causing disturbances in radio reception other than those produced by radio transmitting systems or by alternating current induction from wire circuits. The term "strays" includes atmospheric disturbances and disturbances caused by electrical apparatus such as sparking commutators; sparking contacts in fire alarm apparatus;

Tirrell regulators or elevator controllers; sudden current changes through arc lamps; transient or sparking grounds on power system; electric ignition systems of internal combustion engines, or sparking at third-rail or trolley contactors. (A reduction of the effect of strays on radio reception increases the signal-stray ration).

T-Antenna: A flat-top antenna in which the down lead is taken from the center of the horizontal portion.

Three-Electrode Tube: A combination of a heated cathode, a relatively cold anode, and a third electrode for controlling the current flowing between the other two electrodes, the whole contained within an enclosure evacuated to a low pressure.

This device is variously known as an Audion, Audiotron, Aerotron, Electron Relay, Electron Tube, Pilotron, Triode, Oscillon, Radiotron, etc.

Tickler: See Feed-Back Coil.

Transformer: A device consisting of one coil of wire placed in proximity with another, for the purpose of coupling two circuits together by virtue of the mutual inductance between the two coils. Also used for raising or lowering alternating voltages and currents. When the voltage of a line is increased by a transformer the current is correspondingly decreased and vice-versa. The power remains the same except for losses in the transformer. In this case one coil is wound directly upon the other. The coil connected to the source of power is called the primary and the other coil the secondary.

Undamped Alternating Current: A periodic current (i. e., current passing through successive equal cycles of values) with constant amplitude whose average value is zero.

Volt: See electromotive force.

Volt-Ampere: The product of the current and voltage in a circuit.

Watt: A unit of power 1/746 of a horsepower; 1/1000 of a kilowatt. A d.-c. circuit carrying a current of one ampere with an emf. of one volt can deliver one watt of power.

Wave Antenna: A horizontal antenna the physical length of which is approximately equal to the length of signaling waves to be received, and which is so used as to be strongly directional.

Wave-Length: The ratio of the velocity of propagation of electric waves to the frequency.

Wavemeter: An instrument for measuring frequency and wave-length.

Waves Continuous Key Modulated: (See Continuous Waves, Key Modulated).

Waves Continuous Modulated at Audio Frequency: (See Continuous Waves at Audio Frequency).

Wave-Trap: A device used with a receiving set to improve its selectivity. A commonly used type is a parallel combination of a condenser and an inductor connected in series with the antenna. (See Parallel Resonance.)

How the Commission Brought Order Out of Chaos

Continued from page 266

Elimination of Broadcasters Necessary

Individual members of the commission had, from the very first, realized that elimination of some 300 broadcasters was eventually the only real solution for the overcrowding of the air channels. This number is approximately the total of those who came on the air during the breakdown of the law of 1926.

But the commissioners recognized also that important constitutional questions are involved in such license denials and transfers, and that in some cases court action could be expected. To have undertaken denying licenses at the outset might have tied up the commission by injunction and court orders, preventing it from making any progress in attacking the big problems it faced back in April and May. It, therefore, proceeded to make the best of a bad situation, and carried out both local and national re-allocation of existing stations, denying licenses to none.

But by the end of 1927 with local stations separated at 50-kilocycle intervals; with all stations on even ten-kilocycle

separations; with wave jumpers and power jumpers put back into their proper places as dictated by merit; with the Canadian channels all cleared; and with a band of some 35 non-heterodyning or cleared channels soon to be in operation, the commission found itself in a wholly different situation.

Incidentally, it was known that members of Congress and others interested in radio matters would like to see adjudicated by the courts, the rights of the radio supervisory authority under the 1927 law to deny licenses in order that definite knowledge of the status of the 1927 law could be laid before Congress in planning future radio legislation.

Confirmation of a quorum of the commission's membership was delayed throughout December, January, February and even March—until finally near the close of the latter month, and a year after the appointment of the commissioners by the President, the belated confirmations were made by the Senate, and the Radio Commission was ready to take up its task of clearing the wavelengths and equitably dividing them between States.

Present Personnel of the Federal Radio Commission

Chairman

Ira E. Robinson, W. Va., Zone 2

Vice-Chairman

E. O. Sykes, Miss., Zone 3

Commissioners

O. H. Caldwell, N. Y., Zone 1

Sam Picard, Kans., Zone 4

H. A. Lafount, Utah, Zone 5

Secretary

Carl H. Butman

Chief Counsel

Louis G. Caldwell

Chief Engineer

Dr. J. H. Dellinger

EXECUTIVE DEPARTMENT

The White House Calendar

June 5 to September 22

On June 13, President Coolidge left Washington for Brule, Wisconsin, to spend the summer. He returned to Washington, September 12.

On September 18, the President left Washington for Vermont. He returned on September 22.

Addresses

July 29—Address of President Coolidge dedicating a memorial to Col. William Colvill at Cannon Falls, Minn.

August 15—Address of President Coolidge before the State Convention of the American Legion at Wausau, Wis.

Executive Orders

June 5—An executive order placing to the credit of the Governor of the Virgin Islands the sum of \$260,000 for Government expenses.

June 9—An executive order creating an advisory committee to study and report on Civil Service rules relating to veteran preference not later than December 1, 1928. Members of the committee appointed: Representative Hamilton Fish, Jr., N. Y., Chairman; William C. Deming, President, Civil Service Commission; Brigadier General Frank T. Hines, Director Veterans Bureau; Colonel William J. Donovan, Assistant Attorney General, and Lieutenant Colonel John Thomas Taylor.

June 18—An executive order exempting consulting geologists on reclamation work for the Interior Department from Civil Service rules.

June 22—An executive order changing the name of the Minnesota National Forest, Minn., to the Chippewa National Forest.

August 31—An executive order creating Longview, Wash., a port of customs entry.

Proclamations

July 2—A proclamation setting aside land in the County of San Juan, N. Mex., for the Aztec Ruins National Monument.

July 13—A proclamation amending the regulations of the Department of Agriculture under the Migratory Bird Treaty Act.

July 30—A proclamation putting into effect a treaty of friendship, commerce and consular rights with Latvia.

July 30—A proclamation putting into effect a treaty of friendship, commerce and consular rights with Honduras.

August 2—A proclamation postponing the application of

coastwise provisions of the Merchant Marine Act until September 30, 1928.

August 31—A proclamation increasing rate of duty on Sodium Silicofluoride.

September 14—A proclamation reserving for lighthouse purposes a site on the Island of Lehua, Hawaii.

September 17—A proclamation appealing for aid and assistance for Porto Rico and the Virgin Isles.

Important Civilian Appointments

June 5—Harrison Brand, Jr., of the District of Columbia, to be a member of the Public Utilities Committee.

June 7—Patrick J. Farrell, of the District of Columbia, to be a member of the Interstate Commerce Commission.

June 9—Claude M. Henry, of the District of Columbia, to be a member of the Federal Board of Vocational Education.

June 11—Col. Thomas H. Jackson, U. S. Army, to be president and a member of the Mississippi River Commission.

June 11—John H. Guill, of California, to be a member of the Federal Farm Loan Board.

June 11—Sherman J. Lowell, of New York, to be a member of the U. S. Tariff Commission.

June 11—Abram F. Myers, of Iowa, to be a member of the Federal Trade Commission.

June 19—William S. Culbertson, of Kansas, to be Ambassador to Chile.

June 23—Charles S. Wilson, of Maine, to be Minister to Roumania.

June 27—Jefferson Caffrey, of Louisiana, to be Minister to Colombia.

July 17—H. F. Arthur Schoenfeld, of the District of Columbia, to be Minister to Bulgaria.

July 17—Warren D. Robbins, of New York, to be Minister to Salvador.

July 20—Roy O. West, of Illinois, to be Secretary of the Interior.

August 17—J. Reuben Clark, of Utah, to be Under Secretary of State.

August 21—William F. Whiting, of Massachusetts, to be Secretary of Commerce.

September 14—Nelson McVicar, of Pennsylvania, to be U. S. Judge of the Western District of Pennsylvania.

September 19—Col. Harry Burgess, U. S. Army, to be Governor of the Panama Canal Zone. Effective October 16.

The Federal Radio Commission

Continued from page 265

by President Coolidge. He took office November 21, 1927.

Admiral Bullard died November 24, 1927. His successor, Judge Ira E. Robinson, was not named until March 31, 1928.

The problem confronting the commission has been to bring order out of chaos by placing the 732 broadcasting stations operating when it was organized on the 89 wave lengths available, so as not to create serious interference.

To provide good radio broadcasting service for the people of the United States is only one of the many responsibilities placed on the Federal Radio Commission by the Radio Act.

The Commission's Broad Jurisdiction

Besides making strenuous efforts to take care of all broadcasting stations which are rendering a distinct public service on the 89 available ether channels, the commission has devoted much thought and study to many other uses of radio, placed under its jurisdiction. These uses include many point-to-point stations, transoceanic and transcontinental, 2,000 ship stations, 16,000 amateur operators, some 200 experimental stations and 100 or so technical and trade school stations. Communication by radio with airplane is another growing field for which adequate provision must be made. Safety to life at sea, radio beacons, radio compasses, etc., are other appliances of the greatest importance which the commission has under its control.

The Broadcasting Problem

While the 1927 Radio Act embraces the whole field of radio communication, public interest was centered largely on a single section of it devoted to radio broadcasting. For this reason the work of the Federal Radio Commission for a long time was devoted almost exclusively to clearing up the broadcasting situation. With the physical capacity of the available channels of wave lengths already far exceeded by the number of stations actually in operation and with no provision in the law for the Federal acquisition or condemnation of broadcasting stations in order to reduce the total number, the commission found it necessary to evolve some plan whereby without any unconstitutional exercise of arbitrary authority, the listening public could receive more dependable broadcasting service and whereby a gradual and orderly development could be counted on to bring about a progressive reduction in radio interference.

Important Rulings

Among the outstanding rules and regulations adopted by the commission were orders providing for a separation of 10 kilocycles in frequency between all rural stations and 50 kilocycles between stations in residential sections. Broadcasters were ordered not to deviate more than one-half kilocycle from their assigned frequency. Then the commission ordered all the American broadcasters off the waves assigned to Canada. Radio reception conditions showed gradual improvement throughout the country as the orders of the commission became effective, but with the winter season coming on it was deemed advisable in the autumn of 1927 to clear some channels for distant reception. Accordingly, on November 14, the commission announced a comprehensive plan to

set aside the broadcasting channels from 600 to 1,000 kilocycles as a band to be maintained free of heterodyne, whistles and other radio interference.

The initial step in that plan called for the transfer, effective December 1, 1927, of about 25 stations within the present restricted channels which it believed had been causing most of the heterodyning.

With the broadcasting situation well in hand, the commission on November 17, 1927, made this announcement:

Interference Problems

"About 89 per cent of the time of the Federal Radio Commission has been devoted to the broadcasting service and the clearing of the 89 channels therein, but it has always been cognizant of the fact that there are several thousand other channels used in national and international communications to be considered and regulated under the Radio Act of 1927. The Commission has now come to a place where it must devote part of its time to these bands in an effort to handle these channels which were generally allocated to other services by the Fourth National Radio Conference and the International Radio Telegraph Conference, which has just revised the service allocation.

"The Commission announced a general public hearing to consider applications for licenses submitted by concerns and individuals in the United States who desire to communicate on short waves for January 10, 1928. It now plans to give its attention to the short-wave band comprising the available channels between 16.6 and 150 meters or 18,100 and 2,000 kilocycles. This includes groups of wave lengths assigned to point-to-point, ship, aircraft, relay broadcasting, public toll, public utility, military, naval, multiple press messages and amateur services.

Safety-of-Life Channels

"Although these services, except perhaps the amateurs, are seldom heard of by the average broadcast listener, they are actually of far greater public importance and deserve a far larger part of the Commission's time than they have received in the past. The allocation of safety of life and public service channels demands even more careful consideration than has been accorded the broadcast stations, and this work presents a more difficult problem because of the international phases involved."

In all its acts the Commission has been guided by expert opinion and valuable data on file regarding the stations, and has not been unduly swayed by petitions, letters and telegrams inspired by broadcasters. The fate of the individual broadcaster has been given secondary consideration and his assignments were based solely on his demonstrated ability to render a distinct public service.

Due to the changes in the personnel of the Commission and other unavoidable delays, it was April 5, 1928, before a full Commission was organized with complete constitutional powers and prerequisites. Since then the Commission has been working at top speed trying to solve the manifold, perplexing problems confronting it, giving due regard to the interest of the Government and the general public. The Commission has proceeded on a theory and belief that the radio broadcaster has no vested rights over the air.

Uncle Sam's Book Shelf

Editor's Note—This department of THE CONGRESSIONAL DIGEST was established as a special aid to librarians and students. It resulted in a steady demand on the Government Printing Office for many documents and on July 1, 1928, the Government Printing Office inaugurated the publication of a weekly list of the available publications.

Having done the pioneering work in this field, THE CONGRESSIONAL DIGEST feels that it has placed its many readers in direct contact with the Government Printing Office and consequently may use the space occupied by this department for other helpful features.

Therefore "Uncle Sam's Bookshelf" will be discontinued. Those of our readers who wish to obtain the Government's weekly list of publications may write to the Superintendent of Documents, Government Printing Office, Washington, D. C. Their names will be placed on the mailing list and they will receive the weekly list free of charge.

Problems Raised by the Davis Amendment

Continued from page 263

There has been some difference of opinion as to whether the equality of broadcasting licenses prescribed by the amendment has to do with the actual number of stations or with the actual number of full-time assignments. In other words, is a station operating on full time in one zone to be balanced against two stations dividing time in another zone, the latter to count as only one station? It is my firm conviction that stations cannot be thus balanced and that the courts will construe the provision as requiring an actual equality in number of separate stations, regardless of whether they are dividing time or not. This, I think, can be dem-

onstrated both by the language of the amendment itself, and by the circumstances which led to its enactment. The amendment has as its declared purpose equality of "transmission," as well as of reception. This must mean an equality in number of transmitters. Furthermore, the proviso in the amendment provides for the borrowing of licenses in cases where there is a lack of applications from any zone for its proportionate share. There can hardly be any borrowing until the number is determined, and no number can be determined when two, three or more stations can divide time and still count as only one license.

Sources from which Material in this Number is Taken

Articles for which no source is given have been specially prepared for this number of THE CONGRESSIONAL DIGEST

- 1—Speech in House, Congressional Record, March 19, 1928.
- 2—Speech in House, Congressional Record, March 10, 1928.
- 3—Speech in House, Congressional Record, March 12, 1928.
- 4—Speech in House, Congressional Record, March 12, 1928.

5—Resolutions adopted by Radio Protective Association, filed with the Federal Radio Commission, August 3, 1928.

6—Opinion by L. G. Caldwell, Chief Counsel, Federal Radio Commission, August 22, 1928.

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